WILDLIFE REVIEW

AN ABSTRACTING SERVICE FOR WILDLIFE MANAGEMENT
ISSUED FOR THE INFORMATION OF COOPERATORS
BY THE
BUREAU OF BIOLOGICAL SURVEY
UNITED STATES DEPARTMENT OF THE INTERIOR

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Washington, D. C. No. 22 August, 1939

Biological Survey: Cooperative wildlife research

Couch, Leo K. Review of cooperative wildlife management research, American Wildlife (Investment Bldg., Washington, D. C. 25 cents a copy), 28(4), July-August 1939, pp. 172-177.

Brief statement as to origin, history, and set-up of 11 units (10 active) and notes on their chief findings as to inventories, natural propagation, environmental improvement, and limiting factors on game populations. The work reported on included also demonstration and other educational activities. The titles of several theses by graduate students are given in illustration of the diversity of the investigational work.

Biological Survey: Federal aid act

Day, Albert M. The wildlife restoration program under the Pittman-Robertson Act of 1937, U. S. Dept. Agriculture Miscellaneous Publication 350 (Supt. of Documents, Washington, D. C. 5 cents a copy), 11 pp., May 1939.

Restoration of wildlife by cooperative Nation-State action: how States may qualify to participate; source of revenue; apportionment and method of allocating available funds, types of suitable projects and their maintenance; projects not contemplated by the Act; personnel; text of the law and regulations.

Biological Survey: Refuge program

Anon. Planning for a permanent agriculture, U. S. Dept. Agriculture Miscellaneous Publication 351 (Supt. of Documents, Washington, D. C. 15 cents a copy), 71 pp., June 1939.

The section on refuges (pp. 64-68) discusses the need of wildlife for land and the steps that are being taken to satisfy this requirement for waterfowl, colonial birds, and big game. Present total acreage in refuges is about 11,500,000 acres; waterfowl have some 7,500,000 and need some 3,000,000 more. Relation to this program of the Federal Aid to Wildlife Restoration Act.

Conservation: Bear, Brown

Heintzleman, B. Frank. [Alaska brown bear conservation], Journ. Forestry (Mills Bldg., Washington, D. C. 50 cents a copy), 37(6), June 1939, pp. 510-511.

The kill on Admiralty Island has not exceeded 35 in any year since the existing conservation plan was put into effect (1932) and the animals have materially increased in number. Counts have revealed one brown bear to 2.23 square miles on Chichagof Island and one to 1.85 square miles on Admiralty Island; these seem quite dense for such a large wilderness animal. Bear conservation is now thought to be satisfactory throughout Alaska.

Conservation: Bird enemies of grasshoppers

Barker, Elliott S. Grasshopper plagues and bird conservation, New Mexico (208 W. Gold Ave., Albuquerque, N. Mex. 15 cents a copy),17(6), June 1939, p. 31.

References to plagues in other days and lands and to the universal recognition of birds as enemies of grasshoppers. They constantly check the insects on their breeding grounds while human control of the migrating hordes is costly and of only temporary effectiveness. Encouragement is urged of natural enemies, especially hawks and curlews,by conservation of the birds and their habitats.

Conservation: Desert bighorn

Dixon, Joseph S., and E. Lowell Sumner, Jr. A survey of desert bighorn in Death Valley National Monument, summer 1933, California Fish and Game (Ferry Bldg., San Francisco, Calif.), 25(2), April 1939, pp. 72-95, figs. 26-43.

From 1880, mining developments encroaching upon water supplies and mine employes shooting the animals caused serious decrease in the numbers of desert bighorns. Since the establishment of Death Valley National Monument the animals have the range to themselves, poaching has been gradually eliminated, and a degree of restoration (10-25 percent) has been achieved. The present investigation centered mainly about water holes, the location of 21 of which is shown on a map.

Conservation: Eagles

Lumley, Ellsworth D. The two eagles of North America, Emergency Conservation Committee (734 Lexington Ave., New York, N. Y.), 19 pp., illus., June 1939.

Edited by Herbert Friedmann and with an introduction by Francis H. Herrick this leaflet has the best of sponsers. It describes persecution of eagles, discusses the fabulous character of some of the most serious accusations against the birds, gives the principal facts in the life histories of both the golden and bald eagles and makes a plea for their preservation. Eagles are protected by law in 5 States and by provision in 21, but are still subject to a bounty in Alaska. The publication is designed for school use and includes a list of questions based upon the text and a suggested eagle program for a high school assembly. Bibliography of 19 titles.

Conservation: Guide

Anon. Conservation guide, Garden Club of America (958 Madison Ave., New York, N. Y.), 46 pp., 1939.

A guide to source material for education, planning, and preservation, including many references to books and other publications. Suggested headings for a conservation file or library.

Conservation: Hawks

Wickstrum, R. K. Hawks, Arizona Wildlife and Sportsman (125 North Second Ave., Phoenix, Ariz. 15 cents a copy), 1(5), May 1939, pp. 5-7, 2 charts.

Diversity of hawks, limited number of preponderantly injurious species, protection of hawks by the States, brief notes on food, and reproductions of charts on identification and food habits of western hawks prepared by the National Association of Audubon Societies.

Control: Fish predators

Lagler, Karl F. The control of fish predators at hatcheries and rearing stations, Journ. Wildlife Management (Victor H. Cahalane, National Park Service, Washington, D. C. 75 cents a copy), 3(3), July 1939, pp. 169-179, 1 table.

Author's abstract: "In 1937, 15,223 reptiles, birds, and mammals were killed at 228 fish hatcheries in 38 States according to figures based on returns from a nation-wide poll. Of the several control methods reported, screening and wiring of ponds and raceways and shooting and trapping of predators afforded the greatest protection. Wider use of controls that do not involve the wholesale destruction of actual or supposed predators is recommended."

Control: Policy in national parks

Cahalane, Victor H. The evolution of predator control policy in the national parks, Journ. Wildlife Management (Victor H. Cahalane, National Park Service, Washington, D. C. 75 cents a copy), 3(3), July 1939, pp. 229-237.

Author's abstract: "Since establishment of the first national park in 1872, policy as to protection or destruction of predators has fluctuated with official and public changes of opinion. With few exceptions until about 1925, control was pursued as vigorously as financial means permitted. Methods included trapping, hunting with dogs, poisoning and shooting, the latter being used most extensively after 1920 due to its greater selectivity. As thought advanced, the list of proscribed species became smaller and was finally restricted to the cougar, wolf, and coyote. All control finally ceased in 1935. Predators are and will be protected in the same measure as other park animals."

Control: Of Predators overdone

Pough, Richard. Are we over-controlling predators?, Hunting and Fishing (275 Newbury St., Boston, Mass. 5 cents a copy), 16(6), June 1939, pp. 13, 37, 1 photo.

Control to protect livestock may be justified but extension of the work solely for the alleged benefit of game is bringing protests from men who know wildlife problems. The function of predators as a sanitative force in relation

to wild animal species and associations is emphasized. The number and difficulty of the activities involved prevent man from successfully substituting his own exertions for those of the predators. If there are not enough predators left on a given area to perform their important natural functions, then control has there been overdone.

Cycles: Hare, Snowshoe

Chitty, Dennis, and Charles Elton. The snowshoe rabbit enquiry 1937-38, Canadian Field-Naturalist (582 Mariposa Ave., Rockcliffe Park, Ottawa, Canada. 25 cents a copy), 53(5), May 1939, pp. 63-70, 6 maps, 2 tables.

This progress report based on 585 responses from Canada and 55 from the United States tells of patchy recovery in the former country most marked in the southwest, and of recovery begun in the latter country especially in the east. In some parts of Alaska decline had set in while abundance continued in others.

Cycles: Microtus

Whelan, R. V. Vole plague at Smoky Falls, Ontario, Canadian Field-Naturalist (582 Mariposa Ave., Rockcliffe Park, Ottawa, Canada. 25 cents a copy), 53(4), April 1939, pp. 53-55.

Rise, climax, and decline occurred in a period of 2 years--1936-38. Numbers were great and attracted predators in unusual abundance. Damage to lawns, fruit, ornamental, and other trees and shrubs is described. Tick infestation was high. The sex ratio tended strongly toward males, especially near the end of the peak period.

Destruction: Extinct and vanishing birds

Gowanloch, James N. Vanished Americans, Louisiana Conservation Review (Dept. of Conservation, New Orleans, La.), 7(1), Spring 1939, pp. 39-45, 49, 5 figs.

History and causes of extinction of the great auk, Labrador duck, Eskimo curlew, passenger pigeon, short-tailed albatross, heath hen, masked bobwhite (in the United States), and Carolina parakeet. Three species so reduced in numbers that their survival is problematical are the trumpeter swan, whooping crane, and ivory-billed woodpecker.

Destruction: Highway

Dickerson, L. M. The problem of wildlife destruction by automobile traffic, Journ. Wildlife Management (Victor H. Cahalane, National Park Service, Washington, D. C. 75 cents a copy), 3(2), April 1939, pp. 104-116, 4 figs., 3 tables.

Author's abstract: "It is suggested that an experimental approach be made to the problem of reducing the frequency of fatalities to wildlife resulting from automobile traffic. The data used include observations on roadside cover conditions associated with the presence of victims observed over a period of more than three years and more than 12,000 miles of travel. A statistical comparison is made between data collected by the writer and similar information previously published. The frequency of dead animals is shown to be much greater on highways through plains country where only grass or low herbaceous cover is found than in other parts of the country where woody cover is more common." Bibliography of 10 titles.

Destruction: Winter killing

Trautman, Milton B., William E. Bills, and Edward L. Wickliff. Winter losses from starvation and exposure of waterfowl and upland game birds in Ohio and other northern States, Wilson Bulletin (University of Michigan, Ann Arbor. 60 cents a copy), 51(2), June 1939, pp. 86-104, 8 figs., 2 tables.

Unusually large numbers (tabulated) of waterfowl partly attracted by lavish baiting were on Ohio marshes and lakes during the winter of 1931-32 and a great many of them perished. Details are given as to loss of weight compared to "normal" and cross-sections of breasts illustrated. Winter killing of bob-white, ringneck pheasant, and ruffed grouse also in Ohio and other States is discussed. Bibliography of 28 titles.

Authors' conclusions: "Winter mortality of waterfowl and some species of upland game birds, caused by starvation, exposure to low temperatures, or a combination of both, occurs in widely scattered localities in the northern United States. Such mortality generally takes place during or immediately following severe sleet or snow storms when low temperatures freeze the surface water shutting off the usual food supply. During the average stress period apparently only those birds die which are weakened by disease, parasitism, lead poisoning, mechanical injury such as are made by gunshot wounds, or ice formation over eyes, in bill and nostrils. In extreme stress periods, and especially when the accumulated, adverse effects of winter are most pronounced, mortality of normal birds may occur from starvation and exposure."

Diseases and Parasites: Anthrax in mink

Howarth, C. R., and L. Seglotti. Anthrax in farm-raised mink in Oregon, Journ. Amer. Veterinary Medical Assoc. (221 N. La Salle St., Chicago, Ill. 40 cents a copy), N.S. 74(4), Part II, April 1939, pp. 433, 434.

General notes on anthrax; history of the case reported, pathological and bacteriological findings. "A Gram-positive bacillus, morphologically and culturally identical with Bacillus anthracis, was isolated from mink. Transmission experiments in guinea pigs and a sheep produced symptoms and lesions typical of anthrax infection."

Diseases and Parasites: Arthritis

Fox, Herbert. Chronic arthritis in wild mammals, Trans. Amer. Philosophical Society (Philadelphia, Pa.), N.S., 31(2), Feb. 1939, pp. 73-148, 12 pls., 2 charts, 1 table.

Chronic arthritis similar to that affecting man occurs in other mammals even in the wild. Results from examination of more than 1,700 skeletons are discussed and illustrated. The disease occurs chiefly in larger animals and may possibly be related to locomotion and the associated jolt shock.

Diseases and Parasites: Avian malaria

Hegner, Robert, and Fruma Wolfson. Association of Plasmodium and Toxoplasma-like parasites in birds, Amer. Journ. Hygiene (Prince and Lemon Sts., Lancaster, Pa. $2.50 a copy), 28(3), November 1938, pp. 437-454, 11 figs., 1 table.

Experiments with canaries on strains derived from various wild birds. From authors' abstract: "Observations are presented that favor or oppose the hypothesis that birds containing both Plasmodium and Toxoplasma-like parasites are suffering from a mixed infection with two different types of organisms. Our conclusion is that this is a possibility and that schizogony in reticulo-endothelial cells as part of the life cycle of avian Plasmodium is still to be proved." Bibliography of 20 titles.

Diseases and Parasites: Botulism in silver fox

Pyle, Norman J., and Richard M. Brown. Botulism in foxes, Journ. Amer. Veterinary Medical Assoc. (221 N. La Salle St., Chicago, Ill. 40 cents a copy), N.S. 74(4), Part II, April 1939, pp. 436-439.

Heavy mortality among silver foxes on a ranch in the East was traced to botulism caused by spoiled canned fish. Lesions are described and bacteriological and experimental investigations reported upon.

Diseases and Parasites: Botulism, resistance of vultures to

Kalnbach, E. R. American vultures and the toxin of Clostridium botulinum, Journ. Amer. Veterinary Medical Assoc. (221 N. La Salle St., Chicago, Ill. 40 cents a copy), N.S. 47(3), March 1939, pp. 187-191, 2 tables.

The turkey vulture is highly resistant to both oral and injected doses of the toxin of this bacterium (Type C) and to injections also of Types A and B. The blood sera of both the turkey and black vultures have antitoxic effects, experimental evidence of which is reported. Bibliography of 6 titles.

Diseases and Parasites: Capillaria columbae

Wehr, Everett E. Studies on the development of the pigeon capillarid, Capillaria columbae, U. S. Dept. Agriculture Tech. Bul. 679 (Supt. of Documents, Washington, D. C. 5 cents a copy), 19 pp., 3 figs., 6 tables, May 1939.

Description, illustration, life history, pathology, and control of this nematode which infests not only the common pigeon but also other birds including the mourning dove and turkey.

Diseases and Parasites: Cysticercus

Whitlock, S. C. Infection of cottontail rabbits by Cysticercus pisiformis (Taenia pisiformis), Journ. Wildlife Management (Victor H. Cahalane, National Park Service, Washington, D. C. 75 cents a copy), 3(3), July 1939, pp. 258-260.

Author's abstract: "Infection of Michigan cottontail rabbits by cysticerci of the dog tapeworm, Taenia pisiformis, is a common finding. Many safely edible rabbit carcasses are discarded each year by hunters because of the presence of these parasites. Fear of contracting disease and objection to eating game appearing to be abnormal are the principal factors involved. The pathological effect of these parasites on the rabbits in general appears to be slight though occasional massive infections may damage individual animals."

Diseases and Parasites: Deer, Wisconsin

Minor, Fred T., John Hanson, and A. M. McDermid. Report of two deer yards in Douglas and Bayfield Counties, Wisconsin Conservation Bul. (Wisconsin Conservation Dept., Madison), 4(5), May 1939, pp. 18-24, 1 photo, 1 table.

Description of yards that are so overbrowsed that when the deer are confined to them by deep snow the smaller animals especially, not being able to reach as high as the others, die of starvation and associated maladies. Tabulation and notes on pathology of 26 deer found dead. The diagnoses are of pneumonia 13, bots 18, and starvation 9. Aside from the starvation, perhaps, none of the conditions found would cause serious loss in a deer herd.

Diseases and Parasites: Distemper

Green, R.G., and C. A. Evans. A comparative study of distemper inclusions, Amer. Journ. Hygiene (Prince and Lemon Sts., Lancaster, Pa. $1.00 a section), 29(2), March 1939, pp. 73-87, 4 figs., 3 tables.

Review of study of canine distemper and the characteristic inclusion bodies and of parallel work on fox encephalitis. Notes are given also on the pathology of distemper in minks and ferrets. Authors' conclusions: "(1) Canine distemper and epizootic fox encephalitis can be differentiated with certainty by their respective inclusion bodies, (2) the virus of canine distemper produces

morphologically identical inclusion bodies in dogs, foxes, minks, and ferrets. There are minor differences in the distribution of inclusions in the several species." Bibliography of 19 titles.

Diseases and Parasites: Distemper

Ott, George L., Jr. Treatment of fox distemper, Journ. American Veterinary Medical Assoc. (221 N. La Salle St., Chicago, Ill. 40 cents a copy), N.S. 47(5), May 1939, pp. 522-525, 1 photo, 4 charts.

Description of conditions on a modern fox farm in Wisconsin and of outbreaks of distemper causing mortality of 35-60 percent of the pups. Treatment with homologous anti-canine distemper serum as a prophylactic agent reduced mortality 50 to 66 percent and is considered economically sound.

Diseases and Parasites: Echinococcus

Riley, W. A. The need for data relative to the occurrence of hydatids and of Echinococcus granulosus in wildlife, Journ. Wildlife Management (Victor H. Cahalane, National Park Service, Washington, D. C. 75 cents a copy), 3(3), July 1939, pp. 255-257

Author's abstract: "Despite known occurrence of E. granulosus in domestic animals in the United States and recent evidence that it occurs not uncommonly in Minnesota moose, there is only one authenticated record of the finding of the adult stage in dogs in this country. In examinations of timber wolves, Canis lupus lycaon from the area where the infected moose occurred it was found that 5 out of 8 harbored adult E. granulosus. No infested coyotes or foxes were found. Attention is called to the importance of more extensive studies of the problem and to the opportunities which students of wildlife have to make significant contributions."

Diseases and Parasites: Encephalomyelitis

Van Rooksl, H., and Miriam K. Clarke. Equine encephalomyelitis virus (Eastern type) isolated from ring-necked pheasant, Journ. Amer. Veterinary Medical Assoc. (221 N. La Salle St., Chicago, Ill. 40 cents a copy), N.S. 47(5), May 1939, pp. 465-468.

Material from pheasants from a New Jersey game farm subjected to various laboratory tests which are described, the conclusion being that the infective agent appears identical with the virus that produces the Eastern type of equine encephalomyelitis. The English sparrow was found to be highly susceptible under experimental conditions. Review of recent literature to which 5 citations are given.

Diseases and Parasites: Gapeworm

Delaplane, J. P., and H. O. Stuart. Use of iodine for gapeworms in pheasants, Journ. Amer. Veterinary Medical Assoc. (221 N. La Salle St., Chicago, Ill. 40 cents a copy), N.S. 47(5), May 1939, p. 538.

A few drops of iodine vermicide (diluted according to the directions for internal medication) placed in the trachea with a pipette relieved the birds; autopsies of 2 indicated that all of the parasites had been killed. The article refers to a paper in which barium antimonyl tartrate is recommended for the removal of gapeworms.

Diseases and parasites: Giardia

Travis, Bernard V. Descriptions of five new species of flagellate protozoa of the genus Giardia, Journ. Parasitology (Rockefeller Institute, Princeton, N. J. $1.50 a copy), 25(1), Feb. 1939, pp. 11-17, 1 pl.

From the American bittern, little blue heron, western meadowlark, swamp sparrow, and muskrat. Descriptions, measurements, illustrations, and discussion of relationships.

Diseases and Parasites: Gull, Herring

Harrington, Robert W., Jr. Parasites of the herring gull Larus argentatus smithsonianus, Bowdoin College (Brunswick, Maine) Bul. 6, April 1939, pp. 14-18, charts, mimeographed.

Field notes on the birds, including some on food, and list of parasites including 7 kinds of Trematoda, 6 Cestoda, 1 Nematoda, and 2 Acanthocephala.

Diseases and Parasites: Lead poisoning

[McLean, D.] Shot poisoning of wild ducks, California Conservationist (306 State Office Bldg., Sacramento, Calif. 15 cents a copy), 4(5), May 1939, p. 9.

Report on dead birds seen on various areas and statistics from screening and panning as to the number of shot per acre on 9 different sites (8-56 thousands). [In this report the presence of shot in gizzards seems to be taken as evidence of lead poisoning but on that criterion a very high proportion of wild fowl would have to be adjudged as suffering from the malady. Some evidence from symptoms and lesions should be sought; among the latter, blackening of the lining of the caeca is an indication that lead is being absorbed.]

Diseases and Parasites: Malaria

Stauber, Leslie A. Factors influencing the asexual periodicity of avian malarias, Journ. Parasitology (Lancaster, Pa. $1.50 a copy), 25(2), April 1939, pp. 95-116, 7 figs.

Results of experiments with canaries. Review of literature of which 30 titles are cited. Most of the strains have synchronous rythyms which are multiples of 24 hours dependent upon activities of the host. Author's summary: "(1) A study of the experimental modification of the asexual periodicity of avian malaria was conducted on three strains of P. [lasmodium] cathemerium ('C,' 'D' and 'N') and on one strain of P. relictum var. matutinum ('R'). One

of the strains ('N') was obtained by single-parasite isolation; (2) the synchronous periodicity of reproduction of avian malaria is affected by alternate 12-hour periods of high and low temperature; (3) it is affected by light itself--active through the eyes and not through the body surface--if of sufficient intensity to cause the host to be active; (4) as a corollary to (2), it is associated with rest or sleep which seem to be important orienting factors; (5) it is not affected by host feeding of the type devised in these experiments; (6) it is considered possible that the host may furnish a set of critical temperature conditions which orients the time of segmentation. In such an hypothesis, the period of rest becomes important in that it makes possible the temperature differential necessary for the appearance of the critical value."

Diseases and Parasites: Minnesota investigation

Green, R. G., et. al. Minnesota Wildlife Disease Investigation (Dept. of Bacteriology, University of Minnesota, Minneapolis), Dec. 1938, pp. 87-96, table 40, mimeographed.

Hemoproteus in the blood of mallards in winter; lead poisoning may activate chronic infections. Results as to trapping snowshoe hares. Notes on pathology of 5 hares, 1 skunk, and 2 raccoons. List of publications of R. G. Green and associates on diseases of wildlife, Nos. 1-23 on studies conducted prior to, and Nos. 24-88 subsequent to, the arrangement for cooperation between the University of Minnesota, Minnesota Department of Conservation, and the Biological Survey.

Diseases and Parasites: Polymorphus

Van Cleave, Harley J. A new species of the acanthocephalus genus Polymorphus and notes on the status of the name Prolificollis, Journ. Parasitology (Lancaster, Pa. $1.50 a copy), 25(2), April 1939, pp. 129-131, 3 figs.

P. marilis n. sp. from a scaup duck described and figured; the two generic names mentioned in the title are synonyms.

Diseases and Parasites: Sylvatic plague

Jellison, William L. Sylvatic plague: Studies of predatory and scavenger birds in relation to its epidemiology. Public Health Service. Public Health Reports (Supt. of Documents, Washington, D.C. 5 cents a copy), 54(19), pp. 792-798, 1 table, May 1939.

References to a few notes in previous literature on possible transmission of plague by birds, and account of the author's observations and experiments in southwestern Montana. The author's conclusions are: "Predatory species, especially, transport flea-infested rodents and serve as accidental hosts of rodent fleas. The abundance and variety of rodent fleas found in the nest of a burrowing owl suggest that this species may prove of particular interest. Casts from predatory birds fed plague-infected guinea pig tissue were consistently infectious. Infection was not demonstrated in two instances in

which portions of a plague-infected ground squirrel found dead in nature were used for the infective feedings. Tests on the infectivity of feces of birds being fed plague tissue were consistently negative, but were restricted to a few species." Bibliography of 8 titles.

Diseases and Parasites: Sylvatic plague

Stewart, M. A., and D. B. Mackie. The control of sylvatic plague vectors, Amer. Journ. Hygiene (Prince and Lemon Sts., Lancaster, Pa. $2.50 a copy), 28(3), Nov. 1938, pp. 469-480, 5 tables.

Sylvatic plague continues to spread in the United States. Control should be directed against the primo vectors--fleas--as well as against their rodent hosts. The present report is based on laboratory experiments. Authors' conclusions: "The control of fleas in rodent burrows, as well as control of the rodents themselves, necessary in the effective suppression of sylvatic plague may be accomplished by fumigation with methyl bromide. All stages from the egg to the adult are susceptible to this fumigant, but the adults are more easily killed than are the immature stages. It appears from field tests, that the dosage of liquid methyl bromide, approximately 10 cc per burrow opening, ordinarily used to kill ground squirrels is also sufficient to kill the fleas in all stages of development. It is believed that the spread of bubonic plague occurring through the transportation of plague-flea infested grains, cereals, etc., may be effectively checked by fumigating these cargoes with methyl bromide and that the materials so treated will not in any way be rendered unfit for human consumption." Bibliography of 14 titles.

Diseases and Parasites: Tick, Rabbit

Herman, Carlton M. Occurrence of larval and nymphas stages of the rabbit tick, Haemaphysalis leporis-palustris, on wild birds from Cape Cod, Bul. Brooklyn Ent. Soc. (311 East 4th St., Tucson, Ariz. 60 cents a copy), 33(3), June 1938, pp. 133-134.

Records for 6 species of birds trapped on Cape Cod, Mass., and references to the literature. Apparently the rabbit tick has been found on 47 species of birds of the eastern United States. Some of these may be natural, rather than accidental, hosts and may have to be taken into consideration if control of the tick--a vector of tularemia--should ever be necessitated.

Diseases and Parasites: Tick, Snowshoe hare

Green, R. G., et al. Rabbit tick populations at the Lake Alexander area, 1931-1938, Minnesota Wildlife Disease Investigation (Dept. of Bacteriology, University of Minnesota, Minneapolis), Nov. 1938, pp. 80-86, tables 38-39, 4 graphs, mimeographed.

Of ticks and fleas infesting the hares, the rabbit tick (Haemaphysalis leporis-palustris) is by far the most abundant and doubtless most important. The tick populations are discussed and graphed in relation to those of the hare; their peaks occur together. When the hares numbered from 350 to 475 per

square mile, maximum tick infestations were around 4,000 per animal, but when the rabbits were only 30 to 250 per square mile, the tick maximum was halved. A principle deduced from the study, which probably has broad application, is "that the most effective control seen in nature is that exercised by variations in the size of host populations."

Diseases and Parasites: Trematode in shore birds

Young, R. T. The life history of a trematode (Levinseniella cruzi?) from the shore birds (Limosa fedoa and Catoptrophorus semipalmatus inornatus), Biol. Bul. (Prince and Lemon Sts., Lancaster, Pa. $1.75 a copy), 74(2), April 1938, pp. 319-329, 2 figs, 2 tables.

Locality: La Jolla, Calif.; the birds concerned: marbled godwit and western willet; intermediate hosts: snails and sand crabs. Practically all crabs over 6-7 mm. in length are infested but the infestation of the birds is light. Bibliography of 12 titles.

Diseases and Parasites: Tularemia

Green, Robert G. Tularemia, a common disease in wild animals, Minnesota Conservationist (Dept. of Conservation, St. Paul, Minn. 15 cents a copy), 67, April 1939, pp. 14-16, 2 photos.

Tularemia affects numerous kinds of wildlife in Minnesota, being most serious in relation to the cottontail, ruffed grouse, muskrat, and mice. It is spread chiefly by ticks; of these the rabbit tick seldom bites man and the wood tick has a rather low rate of infection. The chance of a human contracting infection from tick bite is small, almost negligible if all ticks are promptly removed. Tularemia is most prevalent in spring and fall and its incidence reduces rapidly in cold weather. Opening the season on rabbits at the middle of October or later reduces the hazard to the minimum.

Ecology: Biologic balance

Hanson, Herbert C. Ecology in agriculture, Ecology (Prince and Lemon Sts., Lancaster, Pa. $1.50 a copy), 20(2), April 1939, pp. 111-117.

There is enough mention of wildlife in this article to make it worthy of perusal by those interested in biologic balance. "Permanent agriculture must be in adjustment with the environment" and the services of scientists are required to accomplish that end.

Ecology: Census methods

Groffenius, R. J. A method for determining the relative abundance of Microtus pennsylvanicus, Journ. Wildlife Management (Victor H. Cahalane, National Park Service, Washington, D. C. 75 cents a copy), 3(3), July 1939, pp. 199-200.

Author's abstract: "Abundance of M. pennsylvanicus can be determined by noting their effect on oatmeal bait-lines placed in different cover types."

Ecology: Census methods

Leslie, P. H., and D. H. S. Davis. An attempt to determine the absolute number of rats on a given area, Journ. Animal Ecology (Cambridge University Press, 200 Euston Road, N. W. 1, London, England. 20 shillings a copy), 8(1), May 1939, pp. 94-113, 3 figs., 3 tables.

Report on a field experiment in Africa that is of value to those interested in theories of animal populations. Authors' summary: "The results from a series of trappings, all done on the same area in Freetown, Sierra Leone, have been analysed in the light of a theory of trapping, which is merely an adaptation of the elementary kinetic theory of gases. The development of this theory is given in full and the arithmetical analysis of the results has revealed nothing which is inconsistent with the fundamental hypothesis. The probable number of R. rattus on this area has been calculated and the errors involved in this type of estimate are discussed, leading to certain suggestions for the design of such experiments in the future." Bibliography of 6 titles.

Ecology: Census methods

Scott, Thos. G., and Lyle F. Solko. A census of red foxes and striped skunks in Clay and Boone Counties, Iowa, Journ. Wildlife Management (Victor H. Cahalane, National Park Service, Washington, D. C. 75 cents a copy), 3(2), April 1939, pp. 92-98, 2 figs., 3 tables.

Authors' abstract: "A census technique for red foxes and striped skunks developed in Clay and Boone Counties, Iowa is discussed. The data evidenced the following populations: Clay County, foxes, 117; skunks, 945; Boone County, foxes, 351; skunks, 2,331. The numbers of these fur-bearers appeared to vary with the acreage of land having certain slopes. Slopes under 5 to 10 percent and bottom lands appeared largely unattractive to breeding animals of these species."

Ecology: Farm birds

Van Deventer, Wm. C. Studies on the ecology of secondary communities in a deciduous forest area, Ecology (Prince and Lemon Sts., Lancaster, Pa. $1.50 a copy), 20(2), April 1939, pp. 198-216, 5 figs., 2 tables.

Ecological classification of formerly forested areas in northern Illinois as modified by man and their resident bird population. The classification into 6 communities is based on the absence or presence of trees and shrubs. Their characteristics as to other details are discussed especially as to the occurrence of birds. "Animals which survive in an agricultural area do not constitute a well-defined ecological group, but rather represent the remnants of integrated primitive communities which have survived because of special circumstances in each case." The total density of birds in the area in winter was estimated to be 243 per square mile in 1936, and 282 in 1937; corresponding figures for the

summer populations are: 504 and 576. There is a bibliography of 20 titles.

Ecology: Mosquito control operations

Cory, Ernest N., and S. L. Crosthwait. Some conservation and ecological aspects of mosquito control, Journ. Economic Entomology (E. N. Cory, College Park, Md. 75 cents a copy), 32(2), April 1939, pp. 213-215.

Two sections of this paper relate to vertebrates. One discusses "salinity in relation to muskrat food." Ditching allows inflow of salt water that is injurious to the important food plant three-square (Scirpus olneyi), but can be controlled by dikes and tide gates. Some ditched marshes yielded more, others fewer, muskrats and further study is needed for appraising the effects of ditching on these animals. Their food, however, has been preserved. As to "ditching in relation to duck food," the writers say that the growth of wigeongrass (Ruppia maritima) can be preserved by cutting shallow laterals from the main deeper ditches into ponds that otherwise dry up in summer. Deep ditches destroy the value of the ponds. Some ponds have been benefitted by deepening and new ones have been formed, sods from ditches being used to build up their banks. Ditching should be done at other seasons than the nesting period of wild fowl. Increases in black ducks have been noted on the marshes where the favorable methods mentioned have been applied. "An attempt has been made to do those operations necessary for mosquito control in such a manner as to interfere the least with the balance of wildlife as it existed at the beginning of the work, to improve conditions for wildlife feeding, breeding and resting and to collect data upon which definite conclusions, instead of conjectures based on prejudices, can be formulated."

Ecology: Peat lands

Dachnowski-Stokes, A. P. Improvement of unproductive and abandoned peatland for wildlife and related uses, Ecology (Prince and Lemon Sts., Lancaster, Pa., $1.50 a copy), 20(2), April 1939, pp. 187-197, 1 fig.

References to extent of peat lands in the United States and their classification. "It is recognized also that much progress has been made by the U. S. Biological Survey toward a solution of the propagation of plants valuable for wildlife, and the relationships of various species of birds and other animals to native environmental conditions. These and other investigations on changes in plant cover, rate of recovery, wildlife populations and their requirements, have not been considered, as yet, in relation to the three classes of peatland mentioned above. Research along the lines indicated would clarify an understanding of rehabilitating requirements, developmental stages of vegetation, and the plant and animal communities which are effective in changing the appearance of habitats, or have an important temporary or permanent effect upon peat areas that have been inundated. Restoration, improvement, and use of these different types, primarily for wildlife, are in keeping with conservation and land utilization policies. They differ only in the results sought for, that is, in preventing ill-advised and unsuccessful farming operations, in applying restorative measures to meet the needs of different kinds of peatland conditions, and in averting burning, deterioration, and abandonment of a valuable national resource."

Suggestions are made for the improvement of peat areas along river courses, bordering lakes and ponds, and on upland. Proposals are made for future peat investigations and problems are listed under 10 headings.

Ecology: Populations, fluctuations, fur animals

Mohr, Carl O. Trappers' reports reveal furbearer fluctuations in Illinois, Illinois Conservation (Dept. of Conservation, State House, Springfield, Ill.), 4(1), mid-winter 1938-1939 (Feb.), pp. 4-5, charts.

Analysis of 6,000 trappers' reports for the period 1929-36. Fluctuations in the catch, as affected by prices and other factors including actual abundance of the animals, are discussed for foxes, the muskrat, mink, opossum, raccoon, and weasels, and skunks. In summary "muskrat populations have increased steadily x x x mink and coon populations may not have changed much except locally and x x x other predatory furbearers except weasels, have attained high populations which are now either lower or declining."

Ecology: Sonoran biotic province

Dice, Lee R. The Sonoran biotic province, Ecology (Prince and Lemon Sts., Lancaster, Pa. $1.50 a copy), 20(2), April 1939, pp. 118-129, 1 map.

Definition, outline (mapped), discussion, and lists of characteristic species of a zoogeographic area that includes parts of California, Nevada, and Arizona. Bibliography of 22 titles.

Ecology: Territory, great horned owl

Baumgartner, Frederick M. Territory and population in the great horned owl, The Auk (Rudyard Boulton, Field Museum, Chicago, Ill. $1.00 a copy), 56(3), July 1939, pp. 274-282, 2 figs.

Report on studies near Lawrence, Kansas, and Ithaca, N. Y. Author's summary: "(1) The Great Horned Owl maintains a definite territory throughout the nesting season; (2) the male's territory is not only patrolled against all others of its species with the exception of its mate and young but also serves as the range in which both birds hunt for food; (3) in most cases resident birds are found near the nest site at all seasons of the year with the possible exception of a few months in the late summer and fall; (4) normally no other large species of owls are found within the boundaries of the range set up by the male Horned Owl; (5) Horned Owl populations are limited chiefly by human molestation and man-made changes in their environment that result in a scarcity of cover and less frequently in a lack of nesting sites and sufficient food. In optimum range the decided territorial requirements of the males probably determine the nesting density. Populations in such areas seem to average from one to three pairs of nesting owls to the square mile. Over most of the range of the species the nesting density is much lighter; (6) the fact that resident Great Horned Owls throughout most of the year restrict their search for food to a relatively small area has an important bearing upon the economic status of this species." Bibliography of 6 titles.

Education: Conservation clubs

Gutermuth, C. R. Conservation education in Indiana, Pennsylvania Game News (Pennsylvania Game Commission, Harrisburg. 10 cents a copy), 9(2), May 1939, pp. 8-9, 3 photos.

Conservation clubs, numbering 874, paid for producing fingerling fishes, propagating game birds and raccoons, mostly reinvest the receipts in allied projects. Their influence has been good in reducing law infringement. They aid in tree planting, emergency feeding of wildlife, and in soil and water conservation. State representatives attend club meetings and give illustrated lectures there and in the schools.

Education: Public schools

Anon. Units in conservation for West Virginia public schools, Vol. 1--Elementary Schools (Grades 1-8), 120 pp., illus; Vol. 2--Secondary Schools (Grades 7-12), 128 pp., illus. Conservation Commission and State Department of Education (Charleston, W. Va.), April 1939.

The courses suggested for the different grades are presented as to general objectives, specific aims, approach, activities, integration, social relations, and evaluation. Each is accompanied by a bibliography. A check list of vertebrates (except fishes) of the State by M. G. Brooks is included in each volume.

Education: Wildlife extension

Warburton, C.W. The educational work of the Extension Service with reference to wildlife conservation, U. S. Dept. of Agriculture (Washington, D. C.) Extension Service Circ. 304, 6 pp., mimeographed, March 1939.

Fitting wildlife into land-use programs; the farmer is vital to the movement and his cooperation must be obtained. Extension work in Texas is described as an example, and encouragement of farmer-sportsman cooperation is noted for Missouri and West Virginia. The main objective, however, is education through 4-H clubs, progress in which is reported in several States. Conservation camps especially facilitate this phase of the work.

Food Habits

Saari, Matt. Food for forest folk, Minnesota Conservationist (Dept. of Conservation, State Office Bldg., St. Paul, Minn. 15 cents a copy), 69, June 1939, pp. 4-6, 3 figs.

A compiled account with some original observations, pertaining chiefly to deer, moose, and grouse. In compiling, some things have been taken too literally as mergansers eating birch and juniper, and the blue heron taking spruce. Such things are incidentally, perhaps even accidentally, ingested.

Food Habits: Barberry distribution

Molander, L.W. Battling the barberry, Minnesota Conservationist (Dept. of Conservation, St. Paul, Minn. 15 cents a copy), 67, April 1939, pp. 17-18, 2 photos.

Barberries are the spring host plants for the fungus that causes stem rust of wheat, oats, barley, rye, and some 25-30 native grasses. Birds, rodents, and domestic stock scatter the seeds in viable condition. The robin, catbird, cedar waxwing, and "blackbirds" are specified. No aggressive actions are recommended except against the barberry.

Food Habits: Bobcat

Hamilton, W. J., Jr., and Russell P. Hunter. Fall and winter food habits of Vermont bobcats, Journ. Wildlife Management (Victor H. Cahalane, National Park Service, Washington, D. C. 75 cents a copy), 3(2), April 1939, pp. 99-103, 1 table.

Authors' abstract: "Stomachs of 140 bobcats taken in Vermont from fall to late winter over a three-year period were examined. The results indicate that the chief food of the bobcat consists of deer (probably much of it carrion), mice, chiefly Microtus and Peromyscus, varying hares and cottontails, porcupines, squirrels, grouse, shrews, muskrats, carrion, and blue jays. Less frequent items are red and gray foxes, grass, poultry, fishes, mink, and insects." Bibliography of 7 titles.

Food Habits: Corvidae

Imler, Ralph H. Comparison of the food of white-necked ravens and crows in Oklahoma, Wilson Bulletin (University of Michigan, Ann Arbor. 60 cents a copy), 51(2), June 1939, pp. 121-122, table.

Report on stomach contents of 18 ravens and 14 crows picked up at a bombed roost. Nearly half of the food of each group was made up of corn and sorghum grains; with respect to other items, the crow seemed more beneficial than the raven.

Food Habits: Coyote

Bond, Richard M. Coyote food habits on the Lava Beds National Monument, Journ. Wildlife Management (Victor H. Cahalane, National Park Service, Washington, D. C. 75 cents a copy), 3(3), July 1939, pp. 180-198, 3 figs., 2 tables.

Author's abstract: "From 273 droppings and 9 stomachs taken, in all months but February, on the Lava Beds National Monument (adjacent to the Tule Lake Wildfowl Refuge) in Siskiyou and Modoc counties, California, 706 probably non-carrion food items were identified. Of these, 481 or 65.18 percent were mammals (19 species: Felidae 1, Sciuridae 6, Heteromyidae 2, Cricetidae 5, Erethizontidae 1, Ochotonidae 1, Leporidae 2, Corvidae 1); 26 or 3.67 percent

were birds or bird eggs (7 species: Anseriformes 3, Galliformes 2, Passeriformes 2); 8 or 1.08 percent reptiles; 145 or 19.65 percent insects; and 46 or 6.23 percent were vegetable items. Evaluation of effects (as distinguished from activities) of the coyotes is complicated by the occasional or continuous presence of at least 34 other predatory vertebrate species in the area. '... although, to some extent, every vertebrate species on the ... Monument affects the coyote, and is in turn directly or indirectly affected by it, it appears that the coyote plays rather a minor role in the ecology of any of the species it preys upon.' No evidence was found indicating necessity of coyote control on the Lava Beds National Monument. Bibliography of 8 titles.

Food Habits: Deer damage

Wolsh, Stanley. Deer damage in the Brule River valley, Wisconsin Conservation Bul. (Wisconsin Conservation Dept., Madison), 4(6), June 1939, pp. 41-46, 1 map, 2 tables.

At a deer yard and on nearby pine plantations, and grounds surrounding summer homes on a State forest. Species principally affected: white cedar, balsam fir, and white, jack, and Norway pines. Percentages of survival and damage on several sections of a plantation are tabulated; average survival 60 percent, of which 70 percent are damaged.

Food Habits: Ducks

Cottam, Clarence. Food habits of North American diving ducks, U. S. Dept. of Agriculture Technical Bul. 643 (Supt. of Documents, Washington, D. C. 30 cents a copy), 139 pp., 10 pls. (4 col.), 5 figs. 26 tables, April (May) 1939.

This publication completes the series of formal reports by the Biological Survey on food habits of ducks, except for the shoveler and the merganscrs and these have been informally treated (Auk, 39, 1922, pp. 380-386; Leaflet BS-83, 1937, pp. 11-12). The present bulletin deals with 22 species of river and sea ducks for each of which range and habits are generalized and food habits detailed. Material permitting, the food of the young is separately discussed. Bibliography of 97 titles. The publication is well illustrated, relaxation in economy requirements of years standing allowing the presentation of 4 excellent colored plates figuring 16 species.

Food Habits: Ducks

Martin, A. C., and F. M. Uhler. Food of game ducks in the United States and Canada, U. S. Dept. of Agriculture Technical Bul. 634 (Supt. of Documents, Washington, D.C. 40 cents a copy), 156 pp., 153 pls. (frontispiece col.), 137 figs., 11 tables, March (May) 1939.

The illustrations considerably exceed the text of this publication, which, therefore, seems directed primarily toward recognition of duck foods. Statistics accompanied by graphs based on nearly 8,000 stomach analyses show the importance of the principal items in 6 divisions of the United States and 2 of Canada.

The succeeding section of the bulletin is designed to facilitate identification of some 200 of the more important foods by means of a series of outline descriptions, illustrations, and distribution maps; it comments also on the value of the plants to waterfowl, their environmental preferences, and methods of propagation. Seventy-eight pages (including many line drawings and distribution maps) are devoted to plant, and 4-1/2 to animal, foods. Forty pages contain discussion of the propagation of waterfowl food plants and of environmental conditions affecting them. Harvesting, field care, storage, shipment, planting and yields are discussed. Fluctuating water levels, character of bottom, turbidity, silting, action of waves, currents, and ice, salinity, alkalinity, and acidity are physical factors of the environment that receive consideration both as to their effects and possible means of counteracting them. There is a discussion of competitive plants and their control partly based on original investigations especially of the introduced water chestnut. Injurious animals and other adverse factors as drainage and pollution also receive consideration. There is a bibliography of 91 titles and an ample index.

Food Habits: General

Hosley, N. W. The place of foods in wildlife management, Pennsylvania Game News (Pennsylvania Game Commission, Harrisburg. 10 cents a copy), 9(2), May 1939, pp. 6-7, 31, 6 photos.

General discussion of methods of learning about wildlife foods, their utilization, and nutritive values, and of the important foods of animal groups including waterfowl, ruffed grouse, pheasant, bob-white, woodcock, white-tailed deer, cottontail, snowshoe hare, gray squirrel, raccoon, and red fox.

Food Habits: Merganser, American

Caldwell, Cyril. The feeding habits of American mergansers, Canadian Field-Naturalist (582 Mariposa Ave., Rockcliffe Park, Ottawa, Canada. 25 cents a copy), 53(4), April 1939, pp. 53-55.

Observations of their feeding extensively upon eels. "In view of the fact that eels are said to be detrimental to valuable food fishes, such as trout and salmon, in that they destroy quantities of their spawn, Mergansers should be given credit for helping in this way to preserve nature's balance."

Food Habits: Owl, Barn

Bolander, Gordon. Barn owl pellets, The Gull (1695 Filbert St., San Francisco, Calif.), 21(8), Aug. 1939, p. 76.

Report on 1,726 pellets collected from March 1938 to May 1939. Meadow mice averaged about 50 percent of the occurrences in all lots; other high items were pocket gophers and white-footed mice.

Food Habits: Partridge, European

Anon. The food of partridge chicks, Imperial Chemical Industries (Millbank, London, S.W. 1, England) Game Researches, 18, 8 pp., 2 figs., June 1939.

Summary of paper of same title abstracted in WILDLIFE REVIEW, No. 20, May 1939, p. 8, and management observations based on the findings.

Food Habits: Pheasant

Chaddock, T. T. Pheasant food, Wisconsin Conservation Bul. (Wisconsin Conservation Dept., Madison), 4(5), May 1939, p. 44.

Crop contents of a winter specimen collected where there had been no artificial feeding. The principal items were poison sumac seeds and grasshoppers and their eggs. From their appearance, the adult insects are thought to have been dead and dry when eaten, but the eggs had been dug up in their capsules; 563 were counted.

Food Habits: Squirrel, Fox

Whitaker, H. L. Fox squirrel utilization of Osage orange in Kansas, Journ. Wildlife Management (Victor H. Cahalane, National Park Service, Washington, D. C. 75 cents a copy), 3(2), April 1939, p. 117, 1 pl.

Author's abstract: "In eastern and central Kansas the seeds of Maclura pomifera are favored food of Sciurus niger rufiventer. The larger trees furnish summer nesting sites, and the hedges serve as satisfactory feeding and refuge cover. Year-round residence depends upon the presence of mature trees of large species that decay readily to make hollows suitable for winter quarters."

Food Habits: Squirrel, Red

Mollenhauer, Wm., Jr. Table Mountain pine--squirrel food or timber tree?, Journ. Forestry (Mills Bldg., Washington, D. C. 50 cents a copy), 37(5), May 1939, pp. 420-421, 1 photo.

Near Huntington, Pa., red squirrels to get the cones gnaw off so many branches that the trees appear pruned.

Food Habits: Utility of legumes

Graham, Edward H. Legumes: Their erosion-control and wildlife values, U. S. Soil Conservation Service (Washington, D. C.), TP 23, 102 pp., mimeographed, June 1939.

Legumes are discussed as to their value in agriculture including their roles in nitrogen fixation, as weeds, and as poisonous plants, as hosts of insects and fungi, and in erosion control. About half of the publication is devoted to a discussion

of legumes by genera, containing descriptive and distributional notes, and recording their known wildlife values. There are indexes of birds and mammals accompanied by lists of the legumes they are known to utilize, a 10-page bibliography, and a subject index. A useful compilation.

Food Habits: Woodcock

Pettingill, Olin S., Jr. Additional information on the food of the American woodcock, Wilson Bulletin (University of Michigan, Ann Arbor. 60 cents a copy), 51(2), June 1939, pp. 78-82, 2 tables.

Report on 70 stomachs from Nova Scotia examined by the Biological Survey. Lists of food items and their frequency of occurrence both of the lot mentioned and of another (of 124) from New York and New Jersey previously reported upon. The more important foods are earthworms, spiders, beetles, and flies.

Life Histories: Chipmunk, Eastern

Allen, Elsa G. The habits and life history of the eastern chipmunk, Tamias striatus lysteri, New York State Mus. Bul. (Albany), 314, 122 pp., 43 figs., 11 tables, Sept. 1938.

This summary of the literature (8 pp. of bibliography) and of personal observation and experiment during 5 years by a matron of a busy household, like Mrs. Nice's song-sparrow studies, shows what can be done nearby and inexpensively, granted the scientific temperament and the will to do. The report deals with everything that it could reasonably be expected to cover, treating in most detail burrowing, breeding, and feeding habits, and hibernation. Data of interest to specialists on other groups than mammals relate to insect guests in the burrows and to ectoparasites. A thorough study, well reported.

Life Histories: Ground squirrel, Townsend's

Sylvia, Arthur. Breeding habits of Townsend's ground squirrel, Murrelet (234 Johnson Hall, University of Washington, Seattle. 50 cents a copy), 20(1), Jan.-April, 1939, pp. 6-10.

This resident of south-central Washington, quite plentiful in the locality studied in 1934, was much reduced thereafter possibly by bubonic plague. General habits are briefly mentioned and breeding habits treated in more detail. Mating begins shortly after emergence from hibernation; gestation period is about 24 days; litters average 4.75 individuals. Progress in size, weight, and hairing and other characters in captivity is described. Estivation, which passes into hibernation begins in late June about 6 months after spring appearance. Bibliography of 6 titles.

Life Histories: Grouse, Prairie

Henderstrom, F. N., Jr. A study of Wisconsin prairie chicken and sharp-tailed grouse, Wilson Bulletin (University of Michigan, Ann Arbor. 60 cents a copy), 51(2), June 1939, pp. 105-120, 2 figs., 9 tables.

Report on a Farm Security Administration project. Notes are given on population density on this and other areas; it varies from a bird to 13 to one per 100 acres. Mating behavior and dancing grounds are described; some of the latter were used by both species. Nesting chronology; number, fertility and viability of eggs; seasonal decline in size of clutch; causes of nest failures; and occupancy of cover types are tabulated and discussed for each species. The effect of changes in succession on the birds, including those due to man, are described. Man once, by accident, made in central Wisconsin the best prairie grouse habitat in the Middle West; can he now, by design, repeat the feat? Management studies on the Necedah project are intended to answer that question. Bibliography of 22 titles.

Life Histories: Grouse, Ruffed

Fisher, Lee W. Studies of the eastern ruffed grouse in Michigan, Michigan State College, Agr. Expt. Sta. (East Lansing) Technical Bul. 166, 46 pp., 9 figs., 12 tables, June 1939.

A condensed account of several years' technical and obviously successful investigations of Bonasa u. umbellus. Reports on census and habit studies, each separately summarized, make up the bulk of the bulletin. Fluctuations are not uniform throughout the State; the birds prefer the margins of cover areas; densest population was one grouse to 3 acres, average 1 to 5. Ninety percent of the eggs hatched; young were confined in wire netting enclosures about nests and fed there from 1 to 6 days after hatching; the female could be readily caught there with a fly net for banding or observation; average range of a grouse brood was 40 acres; horned owl and house cat are the most important predators; parasites and diseases appear to be a major factor in the decimation of the birds in Michigan; notes on important foods are included. Bibliography of 7 pages.

Life Histories: Pheasant

Randall, Pierce E. Management of the ringneck pheasant in early winter, Pennsylvania Game News (Pennsylvania Game Commission, Harrisburg. 10 cents a copy), 10(4), July 1939, pp. 8-9, 30, 6 photos.

Analysis of winter cover available to pheasants in some of the best range in the State; woody stubblefields, hand-picked cornfields, conifer plantations, waste lands, and hedgerows were the principal types. The chief food is corn but seeds of cornfield weeds also are of value. "There is good reason to believe that standing cornfields determine to a large extent the number of pheasants that an area in Pennsylvania will winter." Mortality in winter is no more than may be considered "normal." "Predation does not appear to be a limiting factor." Cover distant from food is not utilized.

Life Histories: Plover, Piping

Authors. The piping plover. Birds of Long Island, No. 1 (Bird Club of Long Island, Oyster Bay, N. Y. $1.00 a copy), 18 pp., 3 pls. (1 col.), 4 tables, May 1939.

Life history by Le Roy Wilcox, injury feigning by Allan D. Cruickshank, and random notes by J. T. Nichols.

Life Histories: Quail, Valley

Emlen, John T., Jr. Seasonal movements of a low-density valley quail population, Journ. Wildlife Management (Victor H. Cahalane, National Park Service, Washington, D. C. 75 cents a copy), 3(2), April 1939, pp. 118-130, 3 figs., 1 table.

Author's abstract: "The movements and social relations of valley quail, Lophortyx californica vallicola, on the University of California Farm at Davis were followed in detail through 1937. Colored markers placed on legs and tails served to identify individuals in the field. On January 1 there were 113 birds in four coveys. Extra-covey movements were restricted by inter-covey social barriers. During late February and March (mating season) yearling birds wandered extensively beyond the covey boundaries, effecting a 50% reduction in population on the winter territories. Mated pairs left the coveys for nesting early in April. Summer movements, normally restricted by nesting ties, occurred following nest failure or loss of mate. Despite early displays of social intolerance amongst broods, 4 coveys developed during the fall and half of the original birds were relocated on the territories of the preceding winter." Bibliography of 6 titles.

Life Histories: Skunk

Allen, Durward L. Winter habits of Michigan skunks, Journ. Wildlife Management (Victor H. Cahalane, National Park Service, Washington, D. C. 75 cents a copy), 3(3), July 1939, pp. 212-228, 4 pls., 4 tables.

Author's abstract: "In a southern Michigan study of the eastern skunk (Mephitis m. nigra), 143 individuals were handled by box trapping, steel trapping, and the digging of burrows. In a series of weights, 33 males averaged 1,905.1 grams and 30 females averaged 1,411.8 grams in late winter. Thirty-six breeding season autopsies indicated that the older females (separated by weight) bred in late February and young females about a month later. Of 26 burrows excavated, 11 contained skunks. In each of two burrows one male was found with 10 females. In no case was more than one male present with females. Female skunks became inactive in winter earlier than males; hence trapping late in the season takes mostly males and preserves the females as breeders. Conversely, the digging out of winter dens will take a high percentage of females and destroy the source of a possible new fur crop." Bibliography of 27 titles.

Life Histories: Sparrow, English

Weaver, Richard L. Winter observations and a study of the nesting of English sparrows, Bird-Banding (Charles B. Floyd, 210 South St., Boston, Mass. 75 cents a copy), 10(2), April 1939, pp. 73-79, 2 figs.

Study at Ithaca, N. Y., of flocking, winter range, and nesting. There was great disparity in numbers between the wintering and breeding populations of the same area.

Life Histories: Swallow, Tree

Chapman, Lawrence B. Studies of a tree swallow colony, Bird-Banding (Charles B. Floyd, 210 South St., Boston, Mass. 75 cents a copy), 10(2), April 1939, pp. 61-72, 1 fig., tables.

A second paper reporting on an additional 4-years' study at Princeton, Mass. Data for the entire course of the work--7 years--are summarized in a table to show such generally interesting features as numbers of adults and young returning to the colony, numbers of eggs, and reproductive efficiency. Competition with bluebirds and house wrens is described. Numerous parasitic flies (Protocalliphora) were produced at the expense of the fledglings but caused little, or no, mortality. Bibliography of 14 titles; the results of some of these published studies are abstracted in the text.

Life Histories: Thrush, Bicknell's

Wallace, George J. Bicknell's thrush, its taxonomy, distribution, and life history, Boston Soc. Nat. Hist. Proc. (234 Berkeley St., Boston, Mass.), 41(6), pp. 211-401, tables.

This publication, coming to hand too late for adequate abstracting, has been accorded several very favorable reviews in ornithological magazines. Begun as a purely life history study, taxonomic investigation was found necessary to fix the status of Bicknell's thrush; this led to a revision of this form and its allies, the results of which are presented. Distribution and migration records are discussed in the text and tabulated in an appendix. The bulk of the paper is devoted to the home life of this thrush as observed on Mount Mansfield, Vermont; it goes into all phases of the bird's activities in detail. There is a comprehensive summary, and an 8-page bibliography.

Life History: Turkey

Latham, Roger M. Pennsylvania's wild turkey range, Pennsylvania Game News (Pennsylvania Game Commission, Harrisburg. 10 cents a copy), 10(4), July 1939, pp. 5-6, 5 photos, 1 map.

The present range, some 2,000,000 acres, is largely restricted to oak-pine forests on certain geological formations in the southern half of the State. The original range was much larger and the decrease seems to have been brought about chiefly by agricultural and lumbering activities together with loss of chestnut trees through blight. Environmental factors discussed include climatic conditions, food, cover, range, and disease. In addition hunting, both legal and illegal, are considered. Increase in deer has been observed in many instances to be followed by decrease in the turkey, grouse, and rabbit populations.

Life Histories: Woodpeckers

Bent, Arthur C. Life histories of North American woodpeckers, U. S. National Museum Bul. 174 (Supt. of Documents, Washington, D. C. 50 cents a copy), 334 pp., 39 pls., 1939.

Continuation of a now lengthy and always useful series of volumes on life histories of North American birds. The specific accounts treat habits, including courtship and nesting, describe the eggs, plumages, food, behavior, voice, etc., and outline the distribution, and give information on migration. The treatment varies for the species according to the information available. The plates reproduce photographs of excellent quality. There is an extensive bibliography and full index.

Management: Apple trees

Bradbury, Harold M. Management of apple trees in Massachusetts, Journ. Wildlife Management (Victor H. Cahalane, National Park Service, Washington, D. C. 75 cents a copy), 3(3), July 1939, pp. 240-242, 2 pls.

Author's abstract: "To improve persistence of fruits, pruning and releasing in varying degrees and giving different exposures were tried. Best results were obtained from a 50% release to the south and west and no pruning of live wood. Grafts of Malus floribunda ("Bob-white") scions gave speedy and excellent returns, one grafted in 1936 bearing 12 apples in 1937. Grubbing around trees to remove competitive ground growth and the use of nitrates produced larger crops. Because of the difficulty and expense due to isolation, these trees are not sprayed and may become hosts to diseases and insects that would invade neighboring orchards. It is recommended that wild apple trees within 500 yards of commercial orchards be removed."

Management: Bob-white

Stoddard, Herbert L. Cooperative Quail Study Association (Thomasville, Ga.) Seventh Annual Report, 1937-38, 31 pp., June 1939.

Besides information of specific interest to Association members, this report contains a number of sections of general value in connection with wildlife management. One relates to the use of fire, a fuller account of which was abstracted in WILDLIFE REVIEW, No. 20, May 1939, pp. 19-20. Another discusses the wood cutting policies of paper mills in relation to game in the Southeast. In a division on hawks and owls, it is noted that "the most productive preserves appear to be those that wage no campaign against birds of prey other than 'blue darters'." On these preserves, however, "skunks, foxes, opossums, house cats, cur dogs, and certain egg-eating reptiles are systematically reduced in number. x x x Preserves that lay major stress on building up food supply and providing proper cover for quail, and exercise moderate control of important mammal and reptile enemies when and where this seems necessary appear to be on the right road so far as controllable factors are concerned. x x x We feel that crows, shrikes, blue jays, owls, and most of the hawks can be safely disregarded under conditions prevailing below the belt of ice and snow." A special case is

accipiters at dove fields where in the interests of good shooting they must be controlled. The use of pole traps is opposed on the grounds that they are indiscriminate and as generally used, unnecessarily cruel and inhumane.

Reports on experimental and practical work with game food plants relate to sericea lespedeza, sesbania, finger millet, pigeonpea, perilla, chia, and jackbean. Fall plantings especially designed to produce early spring food are discussed as to composition and management. "The seed consistently giving best results x x x consists of sixty pounds of Augusta vetch, thirty pounds of wild winterpea (Lathyrus hirsutus), ten pounds of bluestem wheat, and ten pounds of abruzzi rye; mixed together before planting." Additions to this mixture that are advisable under certain circumstances are discussed. Strains best adapted for producing fall grains also are listed. Experiments with dove field plants including hayseed and mammaloxi soybeans and Texas seeded ribbon cane are reported. Establishment and preservation of refuge cover is advised; wild plum and Chinese privet are especially recommended.

The report gives an account also of studies of mammals and fire ants. Blackhead in both quail and turkey is noted as of rare occurrence.

Management: Cottontail

Gorstoll, Richard. A progress report on Pennsylvania's new rabbit program, Pennsylvania Game News (Pennsylvania Game Commission, Harrisburg. 10 cents a copy), 10(3), June 1939, pp. 4-5, 31, 2 photos.

After a 20-year period of decline in the rabbit population, steps were taken to improve food and cover, provide retreat areas, and restock with native, rather than imported, animals. Progress during 2 years is reported. All expenses figured in transplanting native rabbits cost 35 cents per animal, less than half the expense for imported cottontails.

Management: Farm game

Anon. Game management. What's new in farm science. Part I of the Ann. Rep. Director Agr. Expt. Sta., University of Wisconsin (Madison) Bul. 442, Nov. 1938, pp. 48-51, 1 graph.

Three topics are discussed. Ups and downs of quail furnish clues to best management. A graph shows variations in the quail population of the Prairie du Sac area, so long studied (1929 to 1938) by Errington, Gastrow, and Leopold. Lows seem to be in response to killing winters but also coincide with lows of the grouse cycle; the quail peak in 1933 also coincided with that of grouse and rabbits. Winter losses are greatest when the birds are most abundant. "From these data," the report says, "has been derived the 'Errington Theory of Predation' first proposed by the originator of this investigation," to the effect that predators get more of the birds when they are abundant, fewer when they are scarce. The management deduction is that "it is not necessary to destroy hawks and owls to protect quail in Wisconsin. A more practical way x x x is to furnish more food and cover."

[Comment. The "Errington theory of predation" is a misnomer. The theory is essentially that of predation tending to be proportional to population urged by McAtee in 1932, but earlier stated in its essentials by Beal in 1909. Forbes 1880 and Muir 1931 came near to it and probably others also have done so.]

Why do game birds nest in hayfields? They continue to do so despite availability of other cover and many nests are destroyed. Flushing bars do some good if attentively used but in practice often fail to save the birds or nesting "islands" for them. Spring-sown grain, making lower growth by nesting time, is not so attractive as fall-sown fields, but is not so productive over much of the State, hence probably will not be used much more commonly than at present. If Wisconsin agriculture continues about as it is, wholesale destruction of birds' nests in hayfields will recur.

Mature, well-developed pheasants survive best. From an investigation under way but not completed, the following trends of results are apparent: "(1) When very young pheasants are released, few of them survive. The older they are (up to the full-grown stage) the better their chance of survival; (2) pheasants too small for their age seldom, if ever, are able to live long after being released; (3) there does not seem to be much difference in the ability of wild and artificially-propagated pheasants to survive--provided they are full-grown when released--but what difference there is favors the wild birds. Wild-raised pheasants show less tendency to wander away from the range on which they are planted, and are more apt to form flocks in winter; (4) artificially-raised pheasants seldom weigh as much as wild ones of the same age; (5) localities differ in their ability to 'hold' birds--that is, keep them from wandering or drifting to new range. Poor food or cover may hold birds through the fall, but not through winter."

Management: Farm game

Vaughn, Ernest A. Wildlife report. Eastern Shore Development Project, Soil Conservation Service, U. S. Department of Agriculture, Feb. 1939. Maryland Conservationist (512 Munsey Bldg., Baltimore, Md.), 16(2), Spring 1939, pp. 16-17, 4 photos.

Mid-winter quail censuses showed great increase from 1936 to 1938 and a decided slowing down of the rate in 1939. "During late fall and early winter the preferred foods were cow peas, soy beans, partridge peas, and other wild legumes, bonne, sericea lespedeza, and ragweed." Experimental plantings of bonne produced a fair crop of seeds--an unexpected but satisfactory result so far north. Soy beans and clover sown near bird food patches and woody plantings will partially protect these from rabbit attack. Sericea lespedeza also proved a valuable winter food for cottontails. The author considers that too many of these animals are taken by enemies and that the predator problem is yet to be solved. Thinning hardwoods has improved conditions for wildlife, especially squirrels. "Wolf" trees were girdled and left for dens. Wild turkeys and deer have failed to establish themselves upon the project.

Management: Farmer-sportsman relationship

Cline, Justus H. Farmer-sportsman partnership, Maryland Conservationist (512 Munsey Bldg., Baltimore, Md.), 16(2), Spring 1939, pp. 14-15.

The destiny of wildlife is in the hands of landowners--public and private. The former should set an example of praiseworthy wildlife management. The average farmer is a conservationist but not a sportsman and should be approached on that understanding. The sportsman must join with the farmer in essential husbandry of natural resources. Conservation and restoration of wildlife must be definitely correlated with the nation's business and become a fixed habit of our lives. Production must precede harvesting. Farmers do not like the idea of commercializing wildlife but they do have an affection for it and desire to preserve it. They will welcome the cooperation of sportsmen to that end.

Management: Farmer-sportsman relationship

Montgomery, George A. Game plan that works, Capper's Farmer (Topeka, Kans. 5 cents a copy), 50(5), May 1939, pp. 13, 45, 3 photos.

Popular account of the Wood County, Ohio, system which has been described in articles abstracted in WILDLIFE REVIEW, Nos.: 8, April 1937, pp. 21-22; 12, February 1938, p. 13; 19, April 1939, pp. 27-28; and 20, May 1939, p. 29.

Management: Farmer-sportsman relationship

Short, A. W. Farmer-hunter relations in Ohio, Ohio Conservation Bul. (1106 State Office Bldg., Columbus, Ohio. 10 cents a copy), July 1939, pp. 16-17, 34, illus.

Statement of the difficulties (the same in Ohio as in other States) and of Ohio's way of solving them. Game management agents employed to cultivate good will of the farmers, organize cooperative hunting associations, and establish safety zones and propagation areas on farms. The State also has acquired 100,000 acres of public shooting grounds. Extension has been carried on through youth groups, county agents, and vocational agriculture teachers. Sportsman clubs are taking steps to curb undesirable elements and "farmer-hunter relations are on the up-grade in Ohio."

Management: Feeding deer in winter

Teller, C. Roy. Feeding snowbound deer, Minnesota Conservationist (Dept. of Conservation, St. Paul, Minn. 15 cents a copy), 67, April 1939, pp. 8-9, 3 photos.

Notes on deer foods, exhaustion of supplies at winter yards, and renewing the supply by felling white cedar and other evergreens.

Management: Forest wildlife

Cook, David B. Thinning for browse, Journ. Wildlife Management (Victor H. Cahalane, National Park Service, Washington, D. C. 75 cents a copy), 3(3), July 1939, pp. 201-202, 1 pl.

Author's abstract: "Slashings in northern hardwoods are commonly used to produce browse but are costly to maintain. Moderate thinnings will produce continued crops of highly palatable browse without undue disturbance of the forest and at low cost."

Management: General

Bennitt, Rudolf. Ecology in wildlife management, Outdoor America (1167 Merchandise Mart, Chicago, Ill.), 4(7-8), May-June 1939, pp. 4-6, 9, 5 photos.

Wildlife management is applied ecology. Wildlife ecology is dynamic and must be managed to produce the results desired by man. Management must take into consideration other uses of the land and the welfare of wildlife itself. Three leading sections of the article relate to increase of food and cover, reduction of kill by man, and killing of predators. Predators have values of their own, predation is likely to be negligible where food and cover are abundant, and killing of predators does not necessarily increase the survival of prey species. The real limiting factor should be identified and modified; it may or may not be predation. Restocking may have value in the field of public relations, but seldom has any appreciable effect upon the game population or sufficient ecological justification. Refuges intended to feed a surplus into the general game supply should be designed with the cruising radius of resident species in mind. Trapping and removal is a better way of utilizing the product. Refuges are justified for vanishing remnants and/or research and educational purposes. The best as well as most economical way of increasing the yield of a species is by production in nature through improvement of the range.

Management: General

Morton, James N. Stepping up game production in Pennsylvania, Pennsylvania Game News (Pennsylvania Game Commission, Harrisburg. 10 cents a copy), 10(5), Aug. 1939, pp. 4-5, 26-27, 6 photos.

The three lines of endeavor that seem most essential are: "(1) Improving environment, (2) bettering farmer-sportsman relationships, and (3) making more effective the program of propagation and restocking. The first has chiefly involved cuttings (described in an article abstracted in WILDLIFE REVIEW No. 16, November 1938, p. 26), but also some construction of wildlife shelters and travel ways. The second is largely conducted through the Cooperative Game-Farm Program (that has been frequently noticed in WILDLIFE REVIEW) but to some extent as well by educational efforts. Under the third head are noted improvements in the propagation and distribution of pheasants, wild turkeys, and cottontails.

Management: Harvest in relation to land use

Moss, A. E. Relation between take of upland game and agricultural land use in Connecticut, Journ. Wildlife Management (Victor H. Cahalane, National Park Service, Washington, D. C. 75 cents a copy), 3(3), July 1939, pp. 269-278, 10 figs., 1 table.

Author's abstract: "The Biological Survey research unit at Connecticut State College analyzed the take of game in the State for the years 1927-35 from the returns of hunters' licenses. These data were used in correlating the take of pheasants (Phasianus colchicus) and ruffed grouse (Bonasa u. umbellus) with the open cultivated and forested areas by towns and with the agricultural productivity of the towns rated from information furnished by the Agricultural Economics Department of the State College. The findings indicate that the pheasant population is closely related to soil productivity. The best agricultural lands produce greater returns to the hunter. Density of liberations does not seem to offset lack of soil quality or area in agricultural lands. The ruffed grouse population shows close relationship to forested areas but does not fluctuate with soil quality."

Management: Harvesting

Hicks, Lawrence E. A survey of hunting by permit-holders of controlled hunting associations, Wood County, Ohio, 1938, Ohio Wildlife Research Station (Ohio State University, Columbus) Release 100, 20 pp., 4 figs., 22 tables.

A n annual report; that for 1937 is abstracted in WILDLIFE REVIEW, No. 20, May 1939, p. 29. This summary of returns from a questionary is accompanied by a bibliography of 18 titles, is carried out chiefly through tables and graphs, and is epitomized under 24 heads. It relates chiefly to pheasants but contains information also on Hungarian partridges and rabbits. Farmer hunters outnumber other local hunters 3 to 1 and outside hunters 10 to 1. Average head of game bagged per hunter for the season was: Pheasants 6.13, rabbits 5.39, and partridges 0.34. Illegal kill and crippling losses receive consideration.

Management: Harvesting bob-whites

Bennitt, Rudolf. Reports by quail hunters provide valuable information, Missouri Wildlife (Chamber of Commerce Bldg., Springfield, Mo.), 1(11), June 1939, pp. 9-10, 4 tables, 1 map.

Information derived from a 3,000-man questionary from which an 18 percent return was received. "The 575 cooperators, living in 74 counties, hunted 25,821 hours and killed 37,301 quail. This represents an average, per hunter, of 45.1 hours in the field, 65.1 birds killed, and 1.44 birds killed per hour." Hunters using dogs had 19% greater success than those who did not. The evidence indicates lower quail populations in the prairie regions of the State than elsewhere. Hunting success decreased slightly through the season. The ratio of cocks to hens was 112.8:100.

Management: Harvesting waterfowl, Illinois

Hawkins, Arthur S., and Frank C. Bellrose. The duck flight and kill along the Illinois River during the fall of 1938, American Wildlife (Investment Bldg., Washington, D. C. 25 cents a copy), 28(4), July-Aug. 1939, pp. 178-186, 1 fig., 3 tables.

Description of the flight and analysis of the kill. Tables show the proportion (2-99%) of mallards to other ducks present throughout the season; the composition of the kill at 18 duck clubs (mallard 60% of the shoal-water; ringneck 44% of the deepwater ducks); and a summary of crippling losses (average 36%). The total kill was about 65,000 or one to about each 44 ducks visiting the valley. Three of the strongest factors affecting the kill were: (1) unstable water levels, (2) mechanical harvesting of corn, leaving much grain scattered in fields, and (3) refuges. "A storm of protest" came from hunters who believed the Chautauqua Lake Migratory Waterfowl Refuge spoiled their shooting. [To a degree, it would seem obvious, that is just what refuges are for.] Despite their protected status, many wood ducks were killed. The average kill at duck clubs was 6 legal ducks per man day. [The work should be continued as the questions it poses cannot be answered on the basis of one or a few seasons' observations.]

Management: Harvesting, Crippling loss, pheasant

Randall, Pierce E. Ringneck pheasant crippling losses, Pennsylvania Game News (Pennsylvania Game Commission, Harrisburg. 10 cents a copy), 10(5), Aug. 1939, pp. 3, 31, 1 table.

Average 32 percent, reduced by retrieval of birds wounded by others, to 30.4 percent. Losses greater to novices and hunters without dogs. Details tabulated and discussed.

Management: Inventory

Johnson, F. W. Deer kill records--a guide to management of deer hunting, California Fish and Game (Ferry Bldg., San Francisco, Calif.), 25(2), April 1939, pp. 96-165, figs. 44-71, 29 tables.

A statistical study of data collected on the National Forests of California in 1935 and 1936. They concern 18,000 specimens of 5 races of deer and relate to weight; antler spread, number of points, diameter of beam, and condition; pelage; and flesh. Notes were kept also on place of kill, and to some extent on hunting effort and reward. Analysis was made by tabulating machines. Antler beam measurement is the most accurate single indicator of size in lieu of actual weights. Quality and size of deer proved to be inversely proportional to hunting effort. The season of prime of the animals is thoroughly discussed and management suggestions based on the findings in general are made. Bibliography of 9 titles.

Management: Planting for wildlife and erosion control

Gooding, Leslie N. Notes on native and exotic plants in Region 8, U. S. Soil Conservation Service (Albuquerque, N. Mex.) No. 247, 152 pp., 5 pls., mimeographed, Oct. 1938.

Miscellaneous notes on plants of the southwestern United States. The plants are listed in systematic order, and the remarks refer to their appearance, distribution, utility to animals and man, and use in erosion control (including in some cases planting directions). Indexed.

Management: Planting for wildlife and soil conservation

Clark, Arthur L. Cash for aiding wildlife, Missouri Ruralist (2206 Pine St., St. Louis, Mo. 5 cents a copy), 80(6), March 18, 1939, pp. 5, 18.

Notes on reimbursable practices of the Agricultural Adjustment Administration, of which Missouri farmers can take advantage.

Management: Planting for wildlife and soil conservation

Hill, R. G. Farmers receive payment by following soil building practices favoring wildlife, Michigan Conservation (Michigan Dept. of Conservation, Lansing), 8(10), June 1939, pp. 4-5, 4 photos.

Review of reimbursable practices of the Agricultural Adjustment Administration that can be taken advantage of by farmers, and of a number of proposed additions to the program.

Management: Stocking quail, California

Anon. Why upland game refuges. Associated Sportsman (950 Pacific Bldg., San Francisco, Calif.), 6(5), May 1939, pp. 5, 11.

Some thirty no-shooting and keepered areas were established as part of the game bird restoration program. They are points of release for artificially propagated birds. "Game farm reared birds are not liberated to be shot. It just isn't possible from the standpoint of cost. In order to justify the expense for their rearing they must manage to produce a brood or two of youngsters." The refuges have served also as areas for study of problems associated with upland game bird restoration. Banding studies revealed that some quail lived from 3-5 years, and that overflow from the refuges was too slow to be satisfactory as a restocking measure. Trapping and transplanting were, therefore, resorted to; some of the trapping was done on urban and other areas where shooting is prohibited. Birds reared under natural conditions are superior for restocking and the cost of trapping them is but a fraction of what is required to bring a bird to maturity on a game farm.

Management: Winter feeding, squirrels

Chapman, Floyd B., and Luther L. Baumgartner. Winter feeding of squirrels, Ohio Division of Conservation (Columbus) Bul. 150, 8 pp. unnumbered, 1 pl., 1 table, May 1939.

Reprint of article of the same title abstracted in WILDLIFE REVIEW, No. 21, May 1939, pp. 13-14.

Natural History: Indication of age in quail

Leopold, A. Starker. Age determination in quail, Journ. Wildlife Management (Victor H. Cahalane, National Park Service, Washington, D. C. 75 cents a copy), 3(3), July 1939, pp. 261-265, 1 pl., 3 tables.

Author's abstract: "Working with 901 quail skins of nine American species in the University of California Museum of Vertebrate Zoology, it was found that the outer two primaries and the greater upper primary coverts of the juvenal quail plumage are normally retained through the postjuvenal molt and carried through the first year of life. The presence of these juvenal feathers, therefore, marks a quail as a chick of the previous breeding season. The mottled juvenal coverts are the most easily recognized and dependable of these age indicators."

Natural History: Migration

Lincoln, Frederick C. The migration of American birds (Doubleday, Doran & Co., Inc., Garden City, Long Id., N. Y. $4.00 a copy), 189 pp., 12 col. pls., 22 maps.

An up-to-date account of migration suitable for the general reader. Chapter headings indicating the nature of the contents are: Historical, Origin of migration, Mechanics of migration, Influence of the weather on migration, The dangers in migration, Times of migration, Distances covered in migration, Pelagic migration, Vagrant migration, Bird banding, The evolution of migration routes, and The flyway systems.

Natural History: Snake bite

Dittmars, Raymond L. Snake bites among domestic animals, Journ. Amer. Veterinary Medical Assoc. (221 N. La Salle St., Chicago, Ill. 40 cents a copy), N.S. 74(4), Part II, April 1939, pp. 383-388, 5 figs.

Most of the paper is devoted to a description of the mechanism of snake bite and to remedial measures. Implements for treating snake bite are illustrated. Instances are cited of losses of domestic animals both in the United States and other countries. About 1925, a questionary sent to county livestock inspectors in Texas evoked 60 replies that indicated an average loss of about 1 percent in cattle, sheep, and goats. One complainant reported a loss of approximately 9 percent of caracul-crossed sheep from snake bite on a ranch near El Paso about 1924.

Predation

Morse, Marius A. A local study of predation upon hares and grouse during the cyclic decimation, Journ. Wildlife Management (Victor H. Cahalane, National Park Service, Washington, D. C. 75 cents a copy), 3(3), July 1939, pp. 203-214, 4 tables.

Author's abstract: "From the spring of 1935 to the spring of 1938, population fluctuations of Bonasa umbellus and Lepus americanus were determined for a 2,520-acre forest area in northern Minnesota by periodic censuses using the strip sample method. Greatest population losses occurred in 1935 and 1936, and decimation in the ranks of the grouse apparently preceded that of the hare. Neither was successful in bringing forth any appreciable number of young in 1935. Field observations during the winter of 1935-36 over a period of 4 months indicated that predators, especially raptors, utilized a relatively large percentage of the hares and grouse that were discovered dead. In the same period, disease appeared to be of only very minor consequence as a factor directly responsible for the extensive hare mortality that was evident." Bibliography of 8 titles.

Predators

Swanson, Harold B. The predators of Minnesota, Minnesota Conservationist (Dept. of Conservation, State Office Bldg., St. Paul, Minn. 15 cents a copy), 69, June 1939, pp. 11-12, 4 figs.

General discussion of economic status of predatory birds, snakes, and fur animals.

Propagation: Grouse, Ruffed

Lehmer, C. B. The artificial propagation of ruffed grouse, Pennsylvania Game News (Pennsylvania Game Commission, Harrisburg. 10 cents a copy), 9(3), June 1939, pp. 9, 32, 1 photo; 9(4), July 1939, pp. 11, 31-32, 1 photo.

History of progress in the handling of ruffed grouse in captivity. Despite all advance, limitation on the number of eggs, and a high degree of infertility, still prevent really large-scale production. Selection of birds for breeding success and refinement of methods seem to be the only hope for further advance. Bibliography of 18 titles.

Propagation: Irradiation results, mink

Bissonnette, Thomas Huno, and Everett Wilson. Shortening daylight periods between May 15 and September 12 and the pelt cycle of the mink, Science (Lancaster, Pa. 15 cents a copy), 89(2314), May 5, 1939, pp. 418-419.

Some minks exposed to gradually reduced periods of daylight for a few months attained primeness of fur earlier than control animals; others did not. The authors refer to the experiment as "rather crudely and irregularly carried out."

Research: Carrying capacity

Culley, Matt. The decagon for vegetation studies, Journ. Forestry (Mills Bldg., Washington, D. C. 50 cents a copy), 37(6), June 1939, pp. 492-493, 2 figs.

Illustrations and description of decagons and their use in estimating density of vegetation. The procedure is somewhat slower than in the square-foot-density method but is more accurate.

Research: Food habits

Anon. What are the trout taking?, Game and Gun and the Angler's Monthly (34 Victoria St., London, S.W. 1, England. 1 shilling a copy), 16(164), May 1939, p. 316, figs.

Students of food habits have subjected wildlife to various indignities to which may be added the process here described. It is worth while, however, so far as it yields information without taking life. Illustration and description of a suction bulb and tube with which water is forced into a fish's stomach and withdrawn, carrying with it part of the food content.

Research: Histology in stomach analysis

Baumgartner, Luther L., and A. C. Martin. Plant histology as an aid in squirrel food-habit studies, Journ. Wildlife Management (Victor H. Cahalane, National Park Service, Washington, D. C. 75 cents a copy), 3(3), July 1939, pp. 266-268, 4 pls.

Authors' abstract: "A technique for determining finely comminuted material from stomachs has been tested with some seventy fox squirrels' stomachs collected in Ohio. A combination clearing and mounting solution which makes possible the rapid examination of food materials is described and a detailed method of preparing temporary and permanent slides suggested. Permanent reference slides are essential for comparison. Some diagnostic characters including size and shape of stomata, cell patterns, structural peculiarities of cell walls, distinctive characters of conductive tissue elements, and specialized form of pubescence are illustrated."

Research: Marking birds

Wright, Earl G. Marking birds by imping feathers, Journ. Wildlife Management (Victor H. Cahalane, National Park Service, Washington, D.C. 75 cents a copy), 3(3), July 1939, pp. 238-239, 1 fig.

Feathers of any color can be firmly attached to bases of natural feathers by splicing with metal reinforcement.

Research: Wildlife of unglaciated Ohio

Chapman, Floyd B. The development and utilization of the wildlife resources of unglaciated Ohio, Ohio State University Abstracts of Doctoral Dissertations (Ohio State University Press, Columbus), 28, pp. 55-64, May 1939.

Three years of field research were required to inventory the wildlife, determine land uses, and analyze the ecology of the area. The objectives and methods of the study are briefly outlined in this abstract. Sections are devoted to land use past and present, to wildlife food and cover resources, and to relation of water to wildlife production. Summaries are given of the results of special studies of the gray squirrel, white-tailed deer, and ruffed grouse. Copies of this publication may be obtained from the Ohio Wildlife Research Unit, or the author, Ohio State University, Columbus.

WILDLIFE RESEARCH AND MANAGEMENT LEAFLETS

Issues of interest to wildlife managers additional to those previously mentioned are listed below. Copies of these mimeographed leaflets can be obtained from the Biological Survey, U. S. Department of the Interior, Washington, D. C.

BS-136. The waterfowl situation: 1938-39, 18 pp., 1 graph, 1 map, 2 tables, May 1939.

Comparison of reports on the volume of the flights in both spring and fall migrations of 1937 and 1938. Summary of field surveys of the flyways and wintering grounds. Results of the annual January inventory. Remarks on bag limits and total kill. The waterfowl population continues to increase.

BS-137. Fall and winter food habits of deer in northeastern Minnesota, by Shaler E. Aldous and Clarence F. Smith, 10 pp., 3 figs., 2 tables, June 1939.

Discussion of the food supply and its utilization with report on 72 stomach analyses. The food items and their frequency of occurrence in stomachs are tabulated. Availability of foods determined by field observations indicates decline in the winter carrying capacity of the range studied. Management to correct the situation is suggested.

BS-138. Sperm studies as a guide in fur-animal breeding practice, by Robert K. Enders, 3 pp., June 1939.

Description of equipment and methods used and interpretation of the findings. The practice may be used to reduce the number of failures to impregnate.

BS-140. A survey of the annual fur catch of the United States, 19 pp., June 1939.

Catch for 1934-38 as reported by conservation departments of 27 States; also assembled by species for the year 1937-38.

SPECIAL ARTICLE

Annual plants of outstanding value to wildlife

During preparation of a manuscript on Plants Useful in Upland Wildlife Management, certain experienced field investigators were asked to contribute notes on the value of annual plants often classed as weeds. The information they furnished has been summarized in the manuscript but as fuller transcription of it probably will be of interest and value to readers of WILDLIFE REVIEW, essential parts of the replies [slightly edited] are herewith reproduced. In a few instances remarks are included on plants that are neither annuals nor weeds.

* * *

Spartanburg, S. C.
November 15, 1937.

"I recognize the difficulty which is encountered when plant species commonly known as weeds are recommended for wildlife food. Nevertheless, these so-called weeds apparently provide a major portion of the foods which our song birds and game birds use. They have added importance if we recognize that these weeds are the plants best adapted to the extremes of climate and of land use (or abuse) in each locality.

"When I recall the great protection such plants have given during the drought years on the Great Plains when nothing else would have survived and erosion would have been much more severe, it pleases me even more to analyze the proper value of such plants and find another reason to feel more kindly toward them. I am satisfied that a dependable supply of food for many species of birds would not be available in Oklahoma except for the species which I list:

Short ragweed	Ambrosia elatior
Western ragweed	" psilostachya*
Prostrate amaranth	Amaranthus blitoides
Spiny amaranth	" spinosus
Bighead doveweed	Croton capitatus
Texas doveweed	" texensis
Snow-on-the-mountain	Dicrophyllum marginatum
Hairy paspalum	Paspalum stramineum*

"My experience with Phlox drummondii has been with quail in our cultivated gardens which a resident covey visited daily to eat the maturing seeds and almost scratched the bed out.

"I have come to the conclusion that crotons as a class are of particular value because they are seldom if ever eaten by livestock, which, of course, is of great importance in a grain and livestock country. Our doves in Oklahoma seem to prefer Croton texensis and Amaranthus blitoides to the newly ripened grain sorghums with which they are intermingled.

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* Perennial

"I have found lambsquartois (Chonopodium album) eaten in limited quantities. Our studies in the Southeast are reflecting considerable credit on Croton capitatus, Croton glandulosus, spurge (Chamaesyce proslii), and bullgrass (Paspalum boscianum), all of which have some value as cover crops in cultivated areas. They are, I believe, of little danger to growing crops but should be recognized as vegetative protection against soil erosion and for production of food for wildlife.

"In the Northern Great Plains, the Dakotas particularly, we should not overlook the value of the bristle grasses (Setaria spp.) which furnish a large amount of food for pheasants and possibly song birds in addition to ground protection where it comes into cultivated corn late in the season.

"Of course, you will include the common sunflower (Helianthus annuus)--an A-1 food for doves, quail, etc. I think you are quite right in mentioning such important annual foods when you write of upland wildlife management."

Verne E. Davison.

* * *

Tucson, Arizona
February 15, 1938.

"It is my feeling that in evaluating the various types of foods composing the diets of game birds, too little attention is commonly given to annual plants; particularly is this true in considering their relation to gallinaceous birds of the semi-desert. If our present data are sound it seems to me the value of such plants may often equal and sometimes exceed that of perennials.

"Some three hundred plant and animal species are now recorded from the stomachs of Gambel's quails--about equally divided between plant and animal items. The exact figures are not readily available, but it is known that the volume of annual plant foods greatly exceeds that of insect matter although second in quantity to perennial plant foods. Of the most important annuals the large volume consumed may be of less significance than the frequency and time of their consumption. Among these are numbered alfileria (Erodium cicutarium), carpetweed (Mollugo verticillata), tansymustard (Sophia monziesii), Boerhaavia watsoni, Lotus trispermus, and some of the grasses.

"It appears evident that the sex-stimulating, fertility-producing, and other vitamins necessary to the welfare of wild quail are obtained from these annuals. If these are not available at certain seasons, the quails' natural functions are thrown out of balance. I have noticed that following winters of little rainfall, with the resultant small or retarded production of winter annuals, the nesting season of quail is unsatisfactory. This may be manifested by an unduly large number of unmated birds, the laying of infertile eggs, an impaired hatchability of eggs laid, or a much retarded and shortened nesting season. Seemingly many of the poor quail hatches commonly attributed to drought are the result of a dearth of green plant food during the preceding winter, and are not caused by arid conditions prevailing at the moment.

"It is significant that the best quail ranges in the Southwest are those which produce the greatest numbers and varieties of annuals; conversely, devastated quail ranges are marked by the absence of these plants."

D. M. Gorsuch

* * *

College Station, Texas
November 18, 1937.

"Although the analysis, according to approved Biological Survey methods, of more than 2,000 crops of bob-white, scaled, and Gambel's quails is virtually completed, the data have not, as yet, been summarized. By subordinating all other activities, however, I have checked the records on 1,000 bob-white stomach for Croton, Dicrophyllum, and other species in which you are especially interested. The stomach contents summarized were collected during December 1934 and January 1935; they came from every major ecological type in Texas.

"The records indicate that the twelve most important winter foods of Texas quail, on the basis of frequency of occurrence and gross quantity consumed, are as follows:

1. Croton (especially C. capitatus, C. monanthogynus, and C. punctatus*).
2. Panicum (especially P. texanum, P. fasciculatum, and P. capillare).
3. Holcus (H. halepensis*).
4. Quercus (especially Q. nigra*, Q. virginiana*, Q. stellata*, and Q. rubra*).
5. Paspalum (especially P. stramineum*).
6. Ambrosia (especially A. psilostachya*, A. artemisiaefolia, A. aptera, and A. trifida).
7. Prosopis (chiefly P. glandulosa*).
8. Helianthus (especially H. annuus).
9. Dicrophyllum (D. bicolor and D. marginatum)
10. Chamaecrista (especially C. procumbens and C. fasciculata).
11. Bumelia (especially B. lanuginosa* and B. angustifolia*).
12. Ximenisia (X. encelioides).

"Spurges are the basic winter diet of Texas bob-whites. Croton capitatus ranks first in the eastern pine belt, in the coastal section west to about the Nueces River, and in the oak woodlands of central and northern Texas. Croton punctatus has a similar status in the brush country of the Southwest. Croton monanthogynus and Dicrophyllum (D. bicolor and D. marginatum) are among the first five ranking species in the blacklands of central Texas and elsewhere in bottomlands or areas of tight or heavy soil. Other crotons (C. argyranthemus, C. glandulosus, C. texensis, and C. neo-mexicanus) and other spurges (Acalypha, Chamaesyce, Tragia*, Stillingia, Jatropha*, and Poinsettia), are also readily eaten. In winter it appears that bob-whites consume more croton seeds than they do of all trees and shrubs combined.

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* Perennial

"The seeds of Mexican clover (Richardia scabra and R. brasiliensis) are especially common in quail crops from the Rio Grande section (Brooks and Kleberg Counties). They have appeared also in material from McLennan and other counties to the east, however, and this plant is doubtless of considerable importance throughout regions of sandy soil.

"Croton capitatus and Ambrosia psilostachya were the two food species which responded best to strip plowing on the quail experimental areas at College Station, Texas, in 1936 and 1937. Also important were buffalo-bur (Solanum rostratum) and horsenettle (Solanum sp.).

"The ragweeds (Ambrosia), ranking sixth in importance throughout the State, include two especially valuable species; namely, giant ragweed (Ambrosia aptera) and perennial ragweed (A. psilostachya).

"Ambrosia aptera, which thrives best in rich soil bordering creeks and branches, furnishes considerable cover as well as food. Because of its dual utility, giant ragweed is considered to be one of the major reasons why the bulk of the bob-white population of central Texas winters along drainage ways. Perennial ragweed is also valuable from both the cover and food standpoints, especially in regions of sandy soil. This low, bushy plant holds its foliage well into winter and is largely unpalatable to cattle. Consequently, perennial ragweed is heavily utilized by quail and by Attwater's prairie chickens as well for shade in summer and for food and cover in winter.

"Seeds of pigweed (mainly Amaranthus albus, A. blitoides, A. palmeri, and A. retroflexus) are a common food of Texas quail, having appeared in quantity in crops from Live Oak, Medina, McLennan, Austin, Washington, Lavaca, Crane, Winkler, Reagan, Kennedy, Dawson and other counties. Because Amaranthus is relatively more abundant in western Texas than in eastern Texas, however, it is of greatest importance as a food of the 'Cotton Top' or scaled quail.

"Aside from Croton, Dicrophyllum, and Ambrosia, other plants that the agriculturalist often does not desire are: the broomweeds (Amphiachyris and Gutierrezia), camphor weed (Heterotheca subaxillaris), Johnson grass (Holcus halepensis*), marsh-elder (Iva ciliata and I. angustifolia), pigweed (Amaranthus), thistle or tumbleweed (Salsola kali), bluewood (Ximenesia oncolioides), sunflower (Helianthus), wild indigo (Baptisia*), queen root (Stillingia), bull-nettle (Jatropha*), marestail (Leptilon), worm seed (Chenopodium), and nightshade (Solanum*). All of these plants, however, are extremely important as winter food and cover for quail. Their presence, in abundance, in cultivated areas is usually a sign either of slovenly agriculture or exhausted soil. In pastures, their presence, in quantity, is almost invariably a result--and not a cause--of overgrazing. Under such conditions, it is usually better that the land is producing such weeds, which are valuable to wildlife and of some service from a soil conservation standpoint, than it would be if the land were producing nothing at all.

"In many areas in Texas the so-called noxious weeds, especially Croton, Dicrophyllum, Iva, Ambrosia, Amphiachyris, and Gutierrezia, enable quail to persist in goodly numbers where the birds would otherwise be absent or very scarce.

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* Perennial

In some situations the so-called noxious weeds do much to save the top soil as well as the wildlife. Their values in these respects should not go unrecognized. In fact, it is entirely possible and very probable that many areas in Texas would serve their greatest usefulness producing maximum crops of weeds and wildlife."

Valgene W. Lehmann

* * *

Thomasville, Ga.
November 11, 1937.

"Richardia. R. scabra is a very abundant weed in cultivated lands over much of the deep Southeast, where it is usually known as 'Mexican clover' or 'pursley'. This plant furnishes excellent green (summer) food for deer, wild turkey, and quail. We have used it extensively as a green food in artificial quail propagating, feeding it chopped up and otherwise. We commonly disk (and sometimes fertilize, to produce a more tender, succulent growth) well-seeded fields at intervals of three weeks or so for the voluntear growth. Then this ground is used as a rearing field, and the movable 'growing pens' shifted about on it. While the seed is frequently eaten by quail, it does not seem to be a preferred food, and we believe it to be of low nutritional value, as young quail in earthen-bottomed pens that get the habit of 'mining' this seed, and the seed of the equally abundant buttonweed (Diodia teres) degenerate into 'runts'.

"Florida beggarweed (Meibomia purpurascens). Deer are extremely fond of the growing plant, and frequently make it difficult to produce for quail. The abundant seed furnishes one of the preferred bob-white foods of winter and early spring, and it is extensively planted on the southeastern quail preserves for game food. The species is also a good hay and cover crop plant but is adapted only to the coastal plain of the deep South. It is the only member of this genus (most of which are perennial, and have been experimented with to a lesser extent) so far used on a large scale, and the only one the seed of which can commonly be purchased on the market.

"Panicum. The panic-grasses as a group (we do not know much about their comparative values) seem to be of outstanding value to the quail and wild turkey. This is especially true of the species which ripen their seed in late winter and spring, before other grass and weed seeds become available. Some that remain green all winter furnish a preferred green food of the wild turkey over its southeastern range. I have long suspected that such green food may be a deciding factor in the abundance of quail under truly natural conditions, and that a sufficiency of early panicums may be the reason that quail occasionally reproduce plentifully in regions distant from agriculture.

"The so-called browntop millet (identified as Panicum adspersum, but we are beginning to suspect that this may be incorrect) has become one of the most, if not the most, valuable plants utilized on southeastern quail preserves for early food. It matures an abundant seed crop in six weeks or less, produces well on a wide variety of soils, and the seed is greatly relished by quail, wild turkey, and doves; it is now extensively planted for all of these species. It seems likely that 'Texas millet' (Panicum texanum) may be as valuable in the Southwest for these purposes as 'browntop millet' is in the Southeast. But our

experiments indicate that the 'Texas millet' is not particularly valuable under southeastern conditions, as the seed does not fill well at times. It also requires a long growing season, so is not valuable for early food.

"Paspalum. While seeds of several species of paspalum are extensively utilized as late summer and fall food of quail, the outstanding member of the group here seems to be P. boscianum, which ranks very high as a food-producing plant for the quail, dove, and wild turkey, as well as for a host of finches. It is commonly known as 'bullgrass' or 'watergrass' and grows luxuriantly in rich low ground in corn and other cultivated fields, where it is considered a pest by most farmers. We sometimes plant seed-impregnated ground where we desire to get it started, and it is perpetuated by spring disking. Sometimes it is necessary to fertilize as well as disk on unfavorable upland soils. While the seed can be easily gathered, we have been unable to get dry-stored seed to germinate, and believe that it requires special storage methods. Our first step in bringing in 'bullgrass' on farmed-out soils of quail preserves is to raise the fertility of the ground by the planting of cover crops for nitrogen fixation and humus. As the soils improve in condition 'bullgrass' usually comes in abundantly.

"Partridge peas (Chamaecrista fasciculata and C. nictitans) are of outstanding value to quail over the southeastern coastal plain, the seeds of both furnishing a high percentage of the winter food in many localities. Should be called 'fire weeds' here, as they thrive and seed heavily in old fields and open pinelands that are frequently burned over in mid-spring (March in the deep South), but disappear where pine straw and dead grasses are allowed to accumulate. To produce them in the vast quantity desired on the quail preserve, great care must be used to burn at just the right season. If burned too early the seed may germinate wholesale, only to be completely killed off by late freezes. They can be produced abundantly also in fallow fields by rotation with a row crop like corn--one year in a crop and two to three years fallow. Fire and rotation of crops are the only practicable methods known of maintaining partridge peas in maximum abundance, though disking helps greatly at times and under certain conditions, not yet thoroughly understood. The seed is very difficult and expensive to gather, due to the fact that the pods ripen irregularly and shatter as soon as dry. Some are shattering while the plant is still blossoming.

"Sesbania. S. macrocarpa is now coming into wide use on southeastern quail preserves, as the abundant seeds are valuable to quail throughout the entire winter and spring, once a taste for them has been acquired. The plant grows naturally around the margins of lakes and ponds and on rich low fields. It may become a pest in rice fields, and volunteers heavily in corn on lands of the rich delta type. On upland soils not naturally adapted to its culture, it must be row-planted, fertilized, and often cultivated. It can be perpetuated on well-adapted soils by disking in early spring.

"Ragweed. In the writer's opinion, the short ragweed (Ambrosia elatior) is probably the most valuable single species of plant in the eastern United States to the bob-white and many other seed-eating species. Its disappearance would undoubtedly be a limiting factor of vital importance to seed-eaters were the eradication campaigns waged against it successful, which now seems unlikely. In the north it is one of the few abundant and widely distributed seed-producers

that project above the snow and furnish food at critical times to seed-eating birds, including quail. In the South it is most extensively used by quail from September to January, when the birds normally go on to legumes. It is sometimes produced especially for quail on southeastern quail preserves by disking well-seeded ground in late fall and early winter. Some tobacco-growing experiments indicate that it may have a vitally important place in soil conditioning.

"Several species of the native perennial lespedezas, meibomias, and others of this class, and a great many annual legumes are fine prospects for quail preserve use, but much more experimentation will be necessary to demonstrate their comparative values. Many have been experimented with and are heavily utilized by quail, but the question of whether to use them or not is one largely of practicability. For instance, why gather the seed and culture a native perennial lespedeza when an exotic like Lespedeza sericea may prove much cheaper and more satisfactory on a large scale, and the seed takes the place of that of the whole native group, as frequently seems to be the case?

"We have disked rather extensively in early spring and summer for chocolate weed (Riedlea corchorifolia) on the low rich soils of certain South Carolina places, for quail and dove food, but we only do so where the soils are seeded and especially adapted for it. This is determined by examination of the ground. If it grows luxuriantly in a hog rooting or other disturbed spot, we know the ground is both seeded and adapted, and act accordingly. Otherwise the land may continue for years to grow nothing but an inferior group of plants of little food value to game.

"This principle is utilized in disking for ragweed, beggarweed, sesbania and many others. We also find that some plants grow on hard, compact soils but poorly, and are stimulated greatly by an occasional disking of the soils. Game managers must become students of the soils and become experts in the production of many of the most important foods by cheap cultural methods, just as livestock pasture men must do. And the only way they will ever do it is to get some land and go to work on it. I am losing patience with many of the younger generation of scientific game students who think they are getting somewhere by research without getting their fingers dirty.

"I personally do not find that we must work with a very large group of plants in any one region for quail and turkey production. We have only to produce a lot of each important class of food for the various seasons; the game will balance their food themselves by drawing from a variety of native species normally growing on lands adapted to game. For instance, we may plant one early panicum ('browntop millet') to supplement the native group, one perennial lespedeza (L. sericea), where it is needed, and so on down the list. It is usually a sign of the amateur to plant a great variety, at much expense, for upland game birds; the skilled professional is known by his limited, but vitally important, list and the food that he gets by cheap and efficient cultural methods without planting at all."

Herbert L. Stoddard

* * *

San Francisco, Calif.
January 18, 1938.

"Medicago hispida. The bur-clover is important to seed-eating birds and mammals nearly throughout the year. The California quail consumes this plant more extensively than it does any other single food species in many parts of California. The plant is considered an excellent source of forage by stockmen. The green leaves are important to both stock and wildlife during spring and summer while the burs are heavily utilized during the fall and winter months. The seed is available from commercial seed houses.

"Lupinus (all species). The seeds are important as food for small birds, including quail, and for seed-eating mammals. The plant is of some value as a soil-binder in preventing erosion. However, it should not be grazed by live stock during the summer and fall months because the seeds are toxic, especially to sheep.

"Trifolium (all species). The seeds and leaves of clovers are of high food value to wildlife. The plants are also of undoubted value as forage for livestock as well as being of use in fixing nitrogen in the soil.

"Lotus americanus (and other native species). As in the case of most other legumes, the seeds and leaves of Lotus americanus and others of the genus are highly nutritious and eagerly sought by wildlife. These species probably tend to enrich the pasture lands where they occur by providing a leguminous element in a forage type wherein the grasses usually dominate.

"Melilotus indica. Some doubt has been cast on the value of the Melilotus group to wildlife by Errington's findings with regard to M. alba as a food for the bob-white. However, the writer has observed California quail and their young feeding voluntarily and extensively upon M. indica over a period of several months with, apparently, beneficial results. The seed is available commercially.

"Erodium cicutarium. The value of alfilaria to wildlife seems to be second only to Medicago hispida. The leaves are an important source of food during spring and early summer while the seeds are heavily used in fall and winter. Tests by agricultural experiment stations have demonstrated that this plant is almost as valuable as Medicago hispida for grazing purposes.

"Brassica. The mustards occasionally grow very densely on fallow lands and are then of some value as cover. Whether the seed is of value to any important species of wildlife other than rodents I cannot say positively but what little evidence I have is negative. At least it seems doubtful that quail benefit significantly by these thick mustard stands except to the extent that protective cover is thereby available. On the other hand the mustards are considered rather undesirable weeds by stockmen.

"Eremocarpus setigerus. The seeds of turkey mullein are well liked by quail and doubtless by other wildlife. However, in my experience it occurs mostly on soils which are arid and impoverished either naturally or through overgrazing."

E. Lowell Sumner, Jr.

* * *

Urbana, Ill.
May 10, 1938.

"Recent studies of the food habits of the Hungarian partridge (Perdix perdix) show that adult birds feed mainly on vegetable matter at all seasons. Although young birds eat large amounts of animal matter, chiefly insects, during the first few weeks of life, by late summer they have adopted a diet largely of seeds, grains, and succulent vegetation similar to that of adults.

"During a life history study of the Hungarian partridge in southern Michigan and northern Ohio, the writer made regular observations on feeding habits and collected for study a series of 53 stomachs over a period of about twenty-one months from November 1929 to July 1931 (4). The principal food classes according to a volumetric analysis of stomach contents made by the Food Habits Division of the Bureau of Biological Survey were as follows: Cultivated grains, 42 percent; wild seeds, 26 percent; leaves of grain, grass, and other succulent plant material, 25 percent; animal matter, chiefly insects, 7 percent. Inasmuch as the stomach samples were collected for the most part in a grain growing section, the high total of cultivated grains is largely attributable to the general abundance of waste and unharvested grain, chiefly corn, in this region during the fall and winter months. In general farming sections, observations indicate that the proportion of weed seeds consumed is often considerably higher than indicated above. It is of interest to note that Middleton and Chitty (3) in England found weed seeds and grains approximately in equal amounts in a series of 429 partridge crops collected during all seasons.

"Among wild seeds, four kinds totaling 19 percent of the stomach contents appear to be of especial value as partridge food in the Michigan and Ohio range. These are briefly discussed below.

"Lesser ragweed (Ambrosia artemisiifolia). Ragweed seeds were present in 29, or 55 percent of, partridge stomachs examined and constituted approximately 7 percent of the total volume of food. Although ragweed seeds were eaten from September until April in this region, they were taken in quantity only from November to late February. Since many of the seeds are retained on the plants until past mid-winter, ragweed is usually particularly important as a source of food during December and January snows when many of the other seeds become unavailable. Although ragweed seeds ranked below corn, which constituted 22 percent of the food for the year, and barley, 11 percent, it is evident from field observations that these seeds frequently constitute the chief item of food of certain coveys for considerable periods of time. Wide distribution of ragweeds in this region is favorable to the partridge since this bird, like the bob-white, has a relatively restricted cruising range.

"Green foxtail (Chaetochloa viridis) and yellow foxtail (C. glauca). Seeds of the green foxtail occurred in 13, or 25 percent, of the stomach samples. They were eaten chiefly from September to November, although a few seeds were found in stomachs of birds collected in the spring. Yellow foxtail seeds were present in 10, or 19 percent, of the samples and were eaten from August to November. Seeds of the two foxtails totaled about 10 percent of all food eaten. Yellow foxtail seeds begin to mature early in August before many wild seeds have become available and are sought eagerly by young and adult birds. Since seeds of the yellow foxtail shatter early, they are found in the fall food less fre-

quently than are those of the green foxtail, which ripens a little later and holds its seeds during a longer period.

"Black bindweed (Polygonum convolvulus). Black bindweed occurred in 19 percent of all stomachs and was present in the food from October until February. The seeds are nearly as large as those of ragweed and apparently are taken readily by the partridge wherever they occur. Lack of general abundance of bindweed in this region probably chiefly accounts for the fact that it made up only 2 percent of the food. Kelso (2) reports that black bindweed seed comprised 11 percent of the contents of 96 partridge stomachs collected during fall and winter months in the State of Washington. He found it the chief food item among wild seeds.

"About 20 other seeds, chiefly those of common weeds, constituted approximately 7 percent of the diet of partridges in the Michigan and Ohio range. It was found that several of these seeds are eaten with fair regularity, although in small quantities. Observations indicate that this list could be extended considerably. In this group the polygonums appear to be of some importance. These include ladysthumb (P. persicaria), smartweed (P. pennsylvanicum), water smartweed (P. punctatum), and knotweed (P. aviculare). Seeds of these plants apparently are frequently picked up from the ground during open periods in winter. Casual observation indicates that seeds of this genus suffer somewhat less from rodent damage than those of ragweed and foxtail.

"Seeds of pigweed (Chenopodium album) persist on the plants until winter and are eaten by partridges frequently in late fall and early winter.

"Grass seeds, especially the larger ones such as those of barnyard grass (Echinochloa crus-galli), fingergrass (Synthorisma villosa), and crabgrass (S. sanguinalis) are found frequently, although in small quantities. Witchgrass (Panicum sp.) is eaten to some extent. Hicks (1) states that seeds of bluegrass (Poa sp.) also are eaten by the partridge in Ohio.

"Among early ripening seeds of wild annuals taken in mid-summer are those of cleavers (Galium aparine), mouse-ear chickweed (Cerastium vulgatum), and crowfoot (Ranunculus abortivus), as well as some of the compositae. It is evident that partridges take a variety of seeds, although the cultivated grains and four wild annuals make up the bulk of the seed diet."

References

"1. Hicks, L. E. Food habits of the Hungarian partridge in Ohio. Bul. 24, Bureau of Scientific Research, Ohio Division of Conservation.

"2. Kelso, Leon. 1932. A note on the food of the Hungarian partridge. The Auk 49:204-207.

"3. Middleton, A. D., and Helen Chitty. 1937. The food of adult partridges, Perdix perdix and Alectoris rufa, in Great Britain. Journ. Animal Ecol. 6:322-336.

"4. Yeatter, Ralph E. 1934. The Hungarian partridge in the Great Lakes Region. Univ. of Mich., School of Forestry and Conservation, Bul. No. 5:1-92."

Ralph E. Yeatter

* * *

NOTES AND NEWS

Apparently a national campaign against ragweed is getting under way. Posters are appearing, one issued by The Garden Club of Wilmington, Delaware, urging readers "to destroy ragweed the cause of hay fever. Pull up by the roots x x x and burn." As in the case of drainage for malarial control, this movement puts wildlife proponents in an embarrassing position, since regardless of natural values involved, they can hardly take a stand that seems opposed to public health. Perhaps the main consolation is that noted by Stoddard on a previous page (p. 43).

A book that does not pertain to any of the subjects regularly noticed in WILDLIFE REVIEW but which may, nevertheless, be of interest to many readers is Robert Snedigar's, "Our Small Native Mammals, Their Habits and Care," 308 p., Illus., 1939 (Random House Inc., 20 East 57th St., New York, N. Y. $2.50 a copy). The work is a well-illustrated volume that treats in popular fashion many kinds of animals, from mammals to earthworms, that are likely to be kept in captivity. Information on suitable enclosures, and on food and care, therefore, is emphasized.

California.--A publication by Aaron Gordon and Arthur W. Sampson, "Composition of Common California Foothill Plants as a Factor in Range Management" (University of California, Agricultural Experiment Station Bul. 627, 95 pp., 24 figs., 12 tables, March 1939) is of interest to wildlife managers for its discussion of variation in nutritive value of plants according to season, site, rainfall, and other factors, for its presentation of analyses of some of the same plants with which they have to work, and for its bibliography of 52 titles of related literature.

New Mexico.--An act providing for the protection of non-predator fur-bearing animals passed by the State legislature in 1939 designates such animals as the "muskrat, mink, weasel, civet cat, masked or blackfooted ferret, ringtail cat, raccoon, pine marten, coati-mundi, badger, and all species of foxes." The law authorizes the State Game Commission to "issue permits at any time for the taking of fur-bearing animals doing damage to game, poultry, or livestock."

Wisconsin.--The Wisconsin Agriculturist and Farmer (Racine, Wis. 5 cents a copy) is publishing a series of short popular articles on wildlife management, mostly by Aldo Leopold. Sample titles are "Wildlife conservation on the farm" (65 (24), Nov. 19, 1938, p. 18); "Bob-white whistles at winter" (65 (25), Dec. 3, 1938, p. 16); "Woodlot wildlife aids" (65 (27), Dec. 31, 1938, p. 4); "The farm pond attracts game" (66 (3), Feb. 11, 1939, p. 7); and "Plant evergreens for bird shelter" (66 (9), May 6, 1939, p. 5).

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